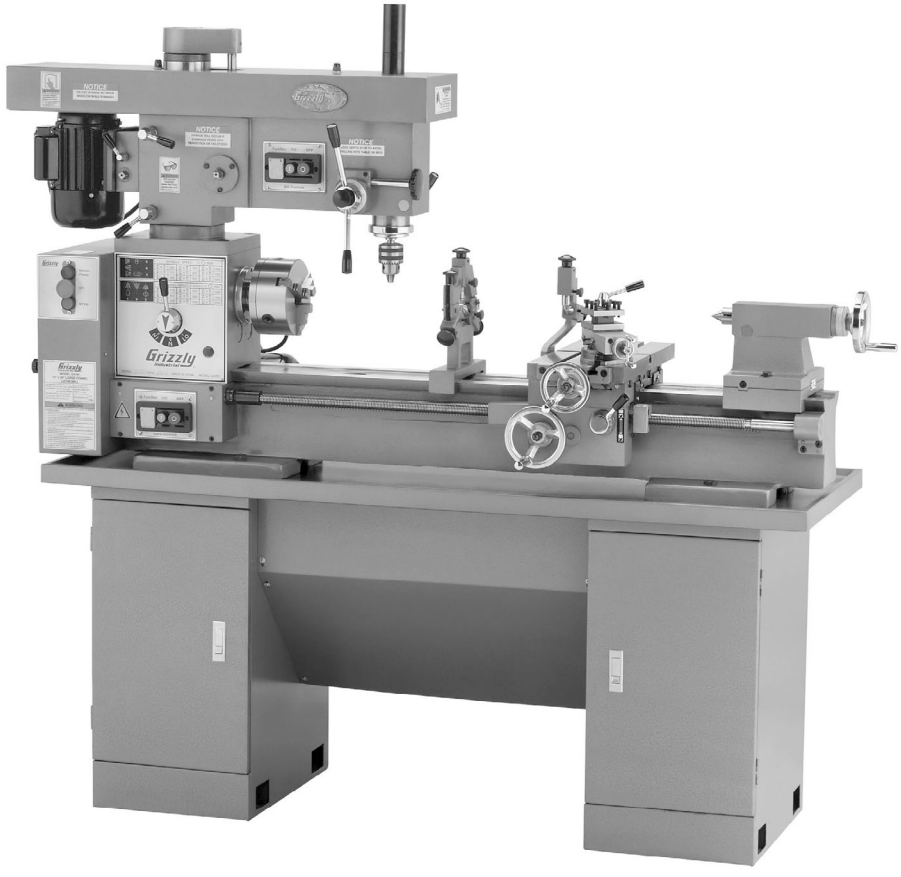
Grizzly Industrial, Inc.®

MODEL G4791
12" x 39" LARGE COMBO LATHE/MILL
OWNER'S MANUAL



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#TS10835 PRINTED IN CHINA

⚠ WARNING!

This manual provides critical safety instructions on the proper setup, operation, maintenance and service of this machine/equipment.

Failure to read, understand and follow the instructions given in this manual may result in serious personal injury, including amputation, electrocution or death.

The owner of this machine/equipment is solely responsible for its safe use. This responsibility includes but is not limited to proper installation in a safe environment, personnel training and usage authorization, proper inspection and maintenance, manual availability and comprehension, application of safety devices, blade/cutter integrity, and the usage of personal protective equipment.

The manufacturer will not be held liable for injury or property damage from negligence, improper training, machine modifications or misuse.

⚠ WARNING!

Some dust created by power sanding, sawing, grinding, drilling, and other construction activities contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are:

- **Lead from lead-based paints.**
- **Crystalline silica from bricks, cement and other masonry products.**
- **Arsenic and chromium from chemically-treated lumber.**

Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: Work in a well ventilated area, and work with approved safety equipment, such as those dust masks that are specially designed to filter out microscopic particles.

Table of Contents

INTRODUCTION 2
- Foreword 2
- Contact Info 2
- Functional Overview 2
- Identification 3
- Machine Data Sheet 4

SECTION 1: SAFETY 7
- Safety Instructions for Machinery 7
- Additional Safety Instructions For Mills 9
- Additional Safety Instructions for Lathes 10

SECTION 2: CIRCUIT REQUIREMENTS 11
- 220V Operation 11

SECTION 3: SETUP 12
- Setup Safety 12
- Items Needed for Setup 12
- Unpacking 12
- Inventory 13
- Clean Up 14
- Site Considerations 14
- Placement & Assembly 15
- Mounting to Shop Floor 16
- Check Gearbox Oil 17
- Test Run 17
- Spindle Break-In 19
- Recommended Adjustments 19

SECTION 4: MILL OPERATIONS 20
- Operation Safety 20
- Basic Mill Controls 20
- Table Movement 22
- Head Movement 22
- Setting Mill Speed 23
- Quill Downfeed 25
- Loading & Unloading Mill Tooling 25

SECTION 5: LATHE OPERATIONS 27
- Operation Safety 27
- Basic Lathe Controls 27
- Mounting/Removing Chuck or Faceplate 29
- 3-Jaw Chuck 30
- 4-Jaw Chuck 32
- Faceplate 33
- Centers 34
- Offsetting Tailstock 35
- Aligning Tailstock 36
- Drilling with Tailstock 37
- Follow Rest 38
- Steady Rest 39
- Carriage 40
- Cross Slide (Table) 40
- Compound Slide 40
- Tool Post 41
- Setting Lathe Speed 42
- Setting Feed Rate 44
- Threading Controls 48

SECTION 6: ACCESSORIES 50

SECTION 7: MAINTENANCE 53
- Schedule 53
- Cleaning & Protecting 53
- Lubrication 54
- Lathe V-Belt Tensioning 60

SECTION 8: SERVICE 61
- Troubleshooting 61
- Adjusting Gibs 64
- Adjusting Table Backlash 65
- Adjusting Half-Nut 66
- Replacing Shear Pins 66
- Lathe Bearing Preload 67

SECTION 9: WIRING 70
- Electrical Safety Instructions 70
- Wiring Overview 71
- Electrical Component Wiring Diagrams 72

SECTION 10: PARTS 74
- Mill Head 74
- Downfeed 76
- Mill Motor 77
- Tailstock 78
- Bed 79
- Lathe Head 82
- Change Gear Box 84
- Lathe Motor 85
- Steady Rest 86
- Follow Rest 86
- Compound Slide 87
- Accessories 88
- Cabinet Stand 89
- Label Placement 90

WARRANTY AND RETURNS 93

INTRODUCTION

Foreword

We are proud to offer the Model G4791 12" x 39" Large Combo Lathe/Mill. This machine is part of a growing Grizzly family of fine metalworking machinery. When used according to the guidelines set forth in this manual, you can expect years of trouble-free, enjoyable operation and proof of Grizzly's commitment to customer satisfaction.

The specifications, drawings, and photographs illustrated in this manual represent the Model G4791 when the manual was prepared. However, owing to Grizzly's policy of continuous improvement, changes may be made at any time with no obligation on the part of Grizzly. For your convenience, we always keep current Grizzly manuals available on our website at **www.grizzly.com**. Any updates to your machine will be reflected in these manuals as soon as they are complete. Visit our site often to check for the latest updates to this manual!

Contact Info

We stand behind our machines. If you have any service questions, parts requests or general questions about the machine, please call or write us at the location listed below.

Grizzly Industrial, Inc.
1203 Lycoming Mall Circle
Muncy, PA 17756
Phone: (570) 546-9663
Fax: (800) 438-5901
E-Mail: techsupport@grizzly.com

If you have any comments regarding this manual, please write to us at the address below:

Grizzly Industrial, Inc.
C/O Technical Documentation Manager
P.O. Box 2069
Bellingham, WA 98227-2069
Email: manuals@grizzly.com

Functional Overview

This combo lathe/mill removes material from a metal workpiece by two methods: 1) Using the lathe to make concentric cuts with a tool moving against a rotating workpiece, and 2) using the mill to move a spinning cutter into a workpiece clamped to the table.

The spindles of the lathe and mill connect to separate motors through a series of pulleys that control the spindle speed, which allows the operator different options for cutting based on the type of metal and size of the workpiece.

For lathe operations, the cutting tool is mounted on the tool post, which is positioned by three different bases—the bottom carriage that moves left and right, the middle table that moves in and out, and the compound slide that moves diagonally. The tailstock supports the end of long pieces, while the steady and follow rests support the center portions against the pressure of the tool.

Typically when using the mill, the spinning cutter is moved against the workpiece that is clamped to the table. For irregular cuts, the workpiece can be moved against the cutter using the carriage and table handwheels.

Identification

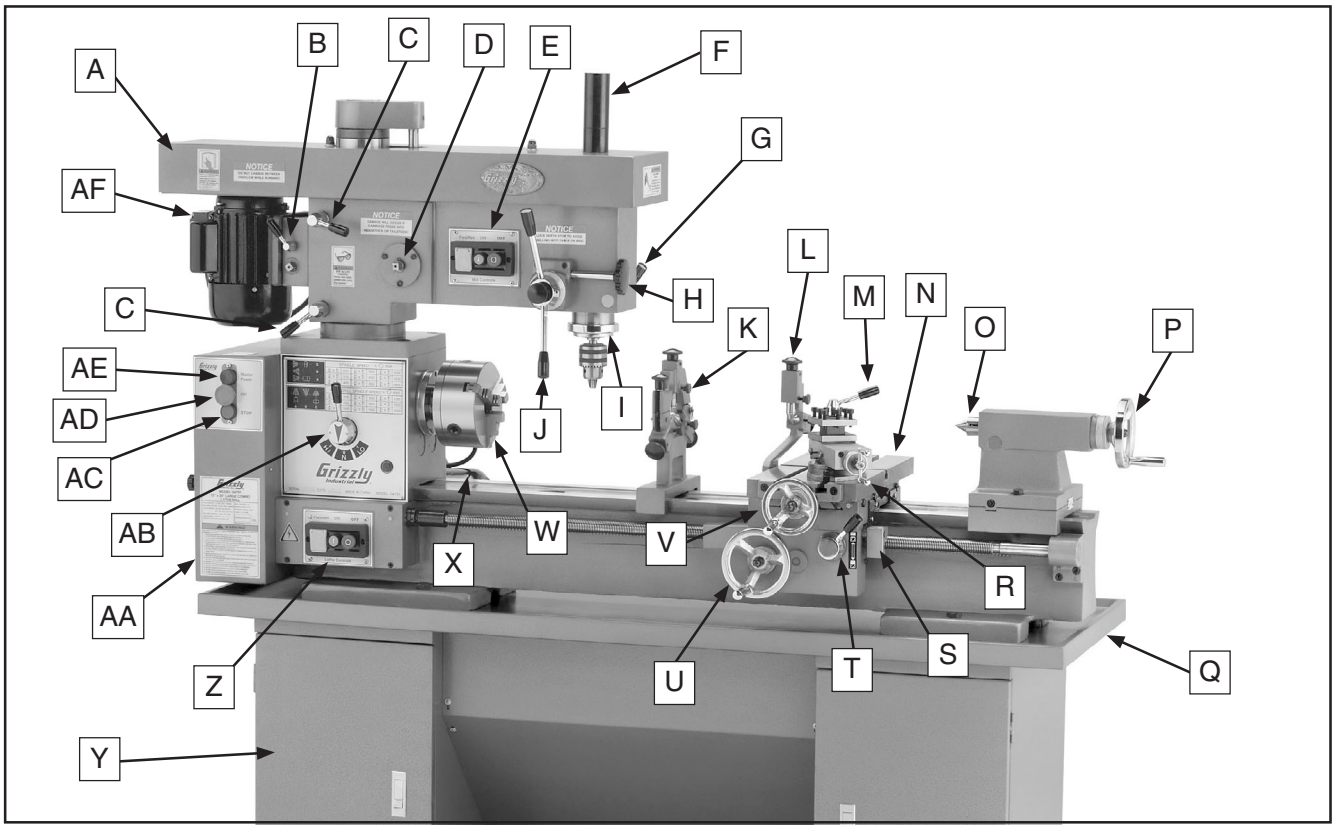


Figure 1. Model G4791 identification.

A. Mill Drive System Cover
B. Mill Motor Lock
C. Column Lock
D. Head Elevation Crank
E. Mill Motor ON/OFF & Direction Switches
F. Spindle Cap
G. Mill Quill Lock
H. Fine Downfeed Knob
I. Mill Quill & Spindle
J. Coarse Downfeed Lever
K. Steady Rest
L. Follow Rest
M. 4-Way Tool Post
N. Table (Cross Slide)
O. Tailstock Quill
P. Tailstock Quill Handwheel
Q. Chip Pan
R. Compound Slide Handwheel
S. Thread Dial
T. Half-Nut Lever
U. Carriage Handwheel
V. Table Handwheel
W. 3-Jaw Chuck
X. Lathe Motor
Y. Cabinet Stand
Z. Lathe Motor ON/OFF & Direction Switches
AA. Change Gear Cabinet
AB. Feed Rate Range Lever
AC. Main Power ON Button
AD. Main Power EMERGENCY Stop Button
AE. Main Power Lamp
AF. Mill Motor

MACHINE DATA SHEET

Customer Service #: (570) 546-9663 · To Order Call: (800) 523-4777 · Fax #: (800) 438-5901

MODEL G4791 12" X 39" LARGE COMBO LATHE/MILL

Product Dimensions:

Weight..... 1110 lbs.
Length/Width/Height..... 69 x 25 x 69 in.
Foot Print (Length/Width)..... 56 x 19-1/2 in.

Shipping Dimensions:

Carton #1

Type..... Wood Crate
Content..... Machine
Weight..... 1208 lbs.
Length/Width/Height..... 73 x 33 x 43 in.

Carton #2

Type..... Cardboard
Content..... Left Stand
Weight..... 95 lbs.
Length/Width/Height..... 21 x 15 x 29 in.

Carton #3

Type..... Cardboard
Content..... Right Stand
Weight..... 88 lbs.
Length/Width/Height..... 21 x 15 x 29 in.

Electrical:

Switch..... Push Button, Reversing
Switch Voltage..... 220V
Cord Length..... 6 ft.
Cord Gauge..... 14 gauge
Minimum Circuit Size..... 15 amp
Plug Included..... No

Motors:

Mill

Type..... TEFC Capacitor Start Induction
Horsepower..... 3/4 HP
Voltage..... 220V
Prewired..... 220V
Phase..... Single
Amps..... 5.5A
Speed..... 1720 RPM
Cycle..... 60 Hz
Number Of Speeds..... 1
Power Transfer ..... Gear/Belt
Bearings..... Sealed

Lathe

Type	TEFC Capacitor Start Induction
Horsepower	1-1/2 HP
Voltage	220V
Prewired	220V
Phase	Single
Amps	7.5A
Speed	1720 RPM
Cycle	60 Hz
Number Of Speeds	1
Power Transfer	Gear/Belt
Bearings	Sealed

Main Specifications:

Lathe Info

Chuck Type	3-Jaw Scroll, 4-Jaw Independent
Chuck Size	6 in.
Faceplate Size	8 in.
Tailstock Taper	MT#3
Tailstock Travel	3 in.
Tailstock Offset	15/32 in.
Cross Slide Travel	9 in.
Carriage Travel	35 in.
Compound Travel	3 in.
No. Of Spindle Speeds	9
Spindle Speed Range	250, 315, 400, 500, 630, 800, 1000, 1250, 1600 RPM
No. Of Longitudinal Feeds	36
Feed Rate	0.0047 - 0.0095 in.
No. Of Inch Threads	20
Thread Range Inch	11 - 40 TPI
No. Of Metric Threads	14
Thread Range Metric	0.5 - 3.0 mm
No. Of Change Gears	14
Swing Over Bed	12 in.
Swing Over Saddle	6-7/8 in.
Dist. Between Centers	39 in.
Spindle Bore	1-1/2 in.
Lathe Spindle Taper	MT#5

Mill Info

Drill Press Taper	MT#3
Mill Drill Spindle Travel	5 in.
Mill Drill Swing	21 in.
Dist. Spindle To Work Table	14-1/4 in.
Dist. Spindle To Bed	16-1/2 in.
Dist. Spindle To Center Line	8-1/2 in.
Mill Head Vertical Travel	4-7/8 in.
Max Tool Bit Size	1/2 in.
Drilling Cap For Steel	5/8 in.
Drilling Cap For Cast Iron	5/8 in.
Table Size Length	16-7/8 in.
Table Size Width	7-7/8 in.
Table Size Thickness	1-1/4 in.
Draw Bar Diameter	12 mm
Draw Bar Length	13-3/4 in.
Draw Bar TPI	M12 X 1.75
No. Of Mill Drill Speeds	9
Mill Drill Speed Range	350, 400, 550, 630, 800, 1000, 1350, 1600, 2000 RPM

Construction

Bed Const.	Hardened and Ground Cast Iron
Headstock Const.	Cast Iron
Body Const.	Cast Iron
Frame Const.	Cast Iron
Headstock Gears Const.	Steel
Stand Const.	Cast Iron
Paint	Epoxy

Other

Bed Width	6-1/8 in.
Floor To Center Height	43 in.
Lead Screw Diameter	0.950 in.
Lead Screw TPI	8
Lead Screw Length	46 in.
Cross Slide Screw Diameter	5/8 in.
Cross Slide Screw TPI	10
Cross Slide Screw Length	16 in.
Coolant System	No
Stand	Yes

Other Specifications:

Country Of Origin	China
Warranty	1 Year
Serial Number Location	On Headstock
Assembly Time	1 hour

Features:

Heavy-Duty Stand with 2 Storage Compartments Included
Hardened and Ground Bedways
T-Slots in Cross Slide

Accessories Included:

1/2" Drill Chuck with Arbor
2 Dead Centers
4-Way Tool Post
6" 3-Jaw Chuck
8" 4-Jaw Chuck
8" Face Plate
Follow Rest
Steady Rest
Threading Dial

SECTION 1: SAFETY

⚠WARNING

For Your Own Safety, Read Instruction Manual Before Operating this Machine

The purpose of safety symbols is to attract your attention to possible hazardous conditions. This manual uses a series of symbols and signal words intended to convey the level of importance of the safety messages. The progression of symbols is described below. Remember that safety messages by themselves do not eliminate danger and are not a substitute for proper accident prevention measures.

⚠DANGER **Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.**

⚠WARNING **Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.**

⚠CAUTION **Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury. It may also be used to alert against unsafe practices.**

NOTICE **This symbol is used to alert the user to useful information about proper operation of the machine.**

⚠WARNING

Safety Instructions for Machinery

1. **READ ENTIRE MANUAL BEFORE STARTING.** Operating machine before reading the manual greatly increases the risk of injury.
2. **ALWAYS USE ANSI APPROVED SAFETY GLASSES WHEN OPERATING MACHINERY.** Everyday eyeglasses only have impact resistant lenses—they are NOT safety glasses.
3. **ALWAYS WEAR A NIOSH APPROVED RESPIRATOR WHEN OPERATING MACHINERY THAT PRODUCES DUST.** Most types of dust (wood, metal, etc.) can cause severe respiratory illnesses.
4. **ALWAYS USE HEARING PROTECTION WHEN OPERATING MACHINERY.** Machinery noise can cause permanent hearing loss.
5. **WEAR PROPER APPAREL.** DO NOT wear loose clothing, gloves, neckties, rings, or jewelry that can catch in moving parts. Wear protective hair covering to contain long hair and wear non-slip footwear.
6. **NEVER OPERATE MACHINERY WHEN TIRED OR UNDER THE INFLUENCE OF DRUGS OR ALCOHOL.** Be mentally alert at all times when running machinery.

⚠WARNING
Safety Instructions for Machinery

7. **ONLY ALLOW TRAINED AND PROPERLY SUPERVISED PERSONNEL TO OPERATE MACHINERY.** Make sure operation instructions are safe and clearly understood.

8. **KEEP CHILDREN/VISITORS AWAY.** Keep all children and visitors away from machinery. When machine is not in use, disconnect it from power, lock it out, or disable the switch to make it difficult for unauthorized people to start the machine.

9. **UNATTENDED OPERATION.** Leaving machine unattended while its running greatly increases the risk of an accident or property damage. Turn machine ***OFF*** and allow all moving parts to come to a complete stop before walking away.

10. **DO NOT USE IN DANGEROUS ENVIRONMENTS.** DO NOT use machinery in damp, wet locations, or where any flammable or noxious fumes may exist.

11. **KEEP WORK AREA CLEAN AND WELL LIGHTED.** Clutter and dark shadows may cause accidents.

12. **USE A GROUNDED POWER SUPPLY RATED FOR THE MACHINE AMPERAGE.** Grounded cords minimize shock hazards. Operating machine on an incorrect size of circuit increases risk of fire.

13. **ALWAYS DISCONNECT FROM POWER SOURCE BEFORE SERVICING MACHINERY**. Make sure switch is in OFF position before reconnecting.

14. **MAINTAIN MACHINERY WITH CARE.** Keep blades sharp and clean for best and safest performance. Follow instructions for lubricating and changing accessories.

15. **MAKE SURE GUARDS ARE IN PLACE AND WORK CORRECTLY BEFORE USING MACHINERY.**

16. **REMOVE CHUCK KEYS OR ADJUSTING TOOLS.** Make a habit of never leaving chuck keys or other adjustment tools in/on the machine—especially near spindles!

17. **DAMAGED MACHINERY.** Check for binding or misaligned parts, broken parts, loose bolts, other conditions that may impair machine operation. Always repair or replace damaged parts before operation.

18. **DO NOT FORCE MACHINERY.** Work at the speed for which the machine or accessory was designed.

19. **SECURE WORKPIECE.** Use clamps or a vise to hold the workpiece when practical. A secured workpiece protects your hands and frees both hands to operate the machine.

20. **DO NOT OVERREACH.** Maintain stability and balance at all times when operating machine.

21. **MANY MACHINES CAN EJECT WORKPIECES TOWARD OPERATOR.** Know and avoid conditions that cause the workpiece to "kickback."

22. **STABLE MACHINE.** Machines that move during operations greatly increase the risk of injury and loss of control. Verify machines are stable/secure and mobile bases (if used) are locked before starting.

23. **CERTAIN DUST MAY BE HAZARDOUS** to the respiratory systems of people and animals, especially fine dust. Be aware of the type of dust you are exposed to and always wear a respirator designed to filter that type of dust.

24. **EXPERIENCING DIFFICULTIES.** If at any time you are experiencing difficulties performing the intended operation, stop using the machine! Contact our Technical Support Department at (570) 546-9663.

⚠WARNING

Additional Safety Instructions For Mills

1. **UNDERSTANDING CONTROLS.** Make sure you understand the use and operation of all controls.

2. **SAFETY ACCESSORIES.** Always use a chip guard in addition to your safety glasses or use a face shield when milling to reduce the risk of injury from flying chips.

3. **WORK HOLDING.** Before starting the machine, be certain the workpiece has been properly clamped to the table. NEVER hold the workpiece by hand during operation.

4. **CHUCK KEY SAFETY.** Always remove chuck key, drawbar wrench, and any service tools immediately after use.

5. **SPINDLE SPEEDS.** Select the spindle speed that is appropriate for the type of work and material. Allow the mill to gain full speed before beginning a cut.

6. **POWER DISRUPTION.** In the event of a local power outage during operation, turn ***OFF*** all switches to avoid possible sudden machine start up once power is restored.

7. **STOPPING SPINDLE.** DO NOT stop the spindle using your hand. Allow the spindle to stop on its own.

8. **CLEAN-UP.** DO NOT clear chips by hand or compressed air. Use a brush or vacuum, and never clear chips while the spindle is turning.

9. **BE ATTENTIVE.** DO NOT leave mill running unattended for any reason.

10. **MACHINE CARE AND MAINTENANCE.** Never operate the mill with damaged or worn parts. Maintain your mill in proper working condition. Perform routine inspections and maintenance promptly. Put away adjustment tools after use.

11. **DISCONNECT POWER.** Make sure the mill is turned ***OFF***, disconnected from its power source and all moving parts have come to a complete stop before changing cutting tools, starting any inspection, adjustment, or maintenance procedure.

12. **AVOIDING ENTANGLEMENT**. DO NOT wear loose clothing, gloves, or jewelry when operating mill. Tie back long hair and roll up sleeves.

13. **TOOL HOLDING.** Always use the proper cutting tools for your operation. Make sure tools are held firmly in place.

14. **CUTTING TOOL INSPECTION.** Inspect drills and end mills for sharpness, chips, or cracks before each use. Replace dull, chipped, or cracked cutting tools immediately. Handle new cutting tools with care. Leading edges are very sharp and can cause lacerations.

15. **SPINDLE DIRECTION CHANGES.** Never reverse spindle direction while the spindle is in motion.

16. **EXPERIENCING DIFFICULTIES.** If at any time you are experiencing difficulties performing the intended operation, stop using the machine! Contact our Technical Support at (570) 546-9663.

⚠WARNING

Like all machinery there is potential danger when operating this machine. Accidents are frequently caused by lack of familiarity or failure to pay attention. Use this mill with respect and caution to reduce the risk of operator injury. If normal safety precautions are overlooked or ignored, serious personal injury may occur.

⚠WARNING
Additional Safety Instructions for Lathes

1. **UNDERSTANDING CONTROLS.** Make sure you understand the use and operation of all controls.

2. **CLEANING MACHINE:** To avoid lacerations, do not clear chips by hand or with compressed air. Use a brush, and never clear chips while the lathe is operating.

3. **USING CORRECT TOOLING:** Always select the right cutter for the job, and make sure cutters are sharp. The right tool decreases strain on the lathe components and reduces the risk of unsafe cutting.

4. **ELIMINATING A PROJECTILE HAZARD:** Always remove the chuck key after use, and never walk away from the lathe with the chuck key installed.

5. **SECURING A WORKPIECE:** Make sure the workpiece is properly held in the chuck before starting the lathe. A workpiece thrown from the chuck could cause severe injury.

6. **AVOIDING OVERLOADS:** Always use the appropriate feed and speed rates.

7. **AVOIDING ENTANGLEMENT INJURIES:** Never attempt to slow or stop the lathe chuck or faceplate by hand; and tie back long hair, ponytails, loose clothing, and sleeves so they do not dangle.

8. **PREVENTING A CUTTING TOOL/CHUCK CRASH:** Always disengage the power feed and half-nut after completing a job.

9. **AVOIDING STARTUP INJURIES:** Make sure the workpiece, cutting tool, and tool post have adequate clearance before starting the lathe. Make sure the spindle RPM is set correctly for the workpiece diameter before starting the lathe. Large parts can be ejected from the chuck if the chuck speed is set too high.

10. **CHUCK SAFETY:** Chucks are surprisingly heavy and awkward to hold, so protect your hands and the bedways. Always use a chuck cradle or piece of plywood over the bedways.

11. **WORKPIECE SUPPORT:** Support a long workpiece if it extends outboard from the headstock so it will not wobble violently when the lathe is turned ***ON***. If the workpiece extends more than 2.5 times its diameter from the chuck, support it by a center or steady rest, or it may deflect and fall out of the chuck while cutting.

12. **MAINTAINING A SAFE WORKPLACE:** Never leave lathe unattended while it is running.

⚠CAUTION

No list of safety guidelines can be complete. Every shop environment is different. Always consider safety first, as it applies to your individual working conditions. Use this and other machinery with caution and respect. Failure to do so could result in serious personal injury, damage to equipment, or poor work results.

SECTION 2: CIRCUIT REQUIREMENTS

220V Operation

⚠WARNING

Serious personal injury could occur if you connect the machine to power before completing the setup process. DO NOT connect the machine to the power until instructed later in this manual.

⚠WARNING

Electrocution or fire could result if machine is not grounded and installed in compliance with electrical codes. Compliance MUST be verified by a qualified electrician!

Full Load Amperage Draw

This machine draws the following amps under maximum load:

Mill Motor Amp Draw ..... 5.5 Amps
Lathe Motor Amp Draw ..... 7.5 Amps

Power Supply Circuit Requirements

You MUST connect your machine to a grounded circuit that is rated for the amperage given below. Never replace a circuit breaker on an existing circuit with one of higher amperage without consulting a qualified electrician to ensure compliance with wiring codes. **If you are unsure about the wiring codes in your area or you plan to connect your machine to a shared circuit, consult a qualified electrician.**

Minimum Circuit Size ..... 15 Amps

Power Connection Device

The type of plug required to connect your machine to power depends on the type of service you currently have or plan to install. We recommend using the plug shown in **Figure 2**.

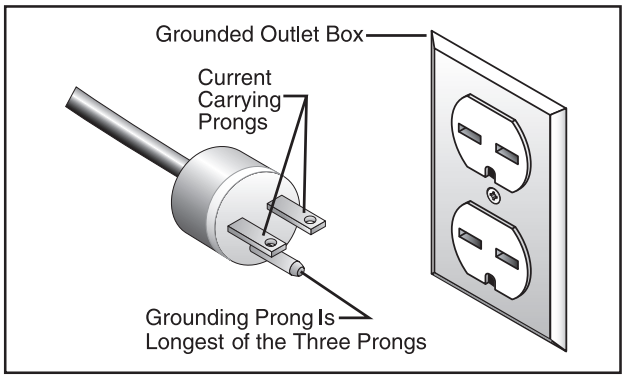


Figure 2. NEMA 6-15 plug and receptacle.

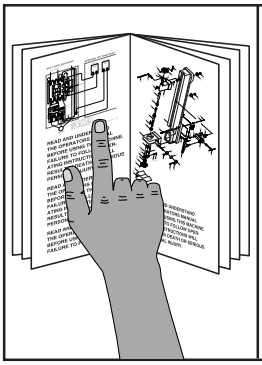
Extension Cords

Using extension cords may reduce the life of the motor. Instead, place the machine near a power source. If you must use an extension cord:

- Use at least a 14 gauge cord that does not exceed 50 feet in length!
- The extension cord must also have a ground wire and plug pin.
- A qualified electrician MUST size cords over 50 feet long to prevent motor damage.

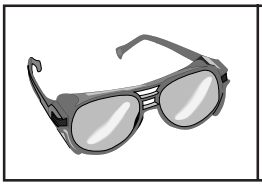
SECTION 3: SETUP

Setup Safety



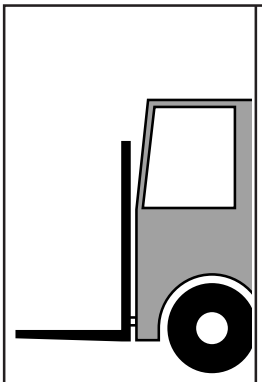
⚠WARNING

This machine presents serious injury hazards to untrained users. Read through this entire manual to become familiar with the controls and operations before starting the machine!



⚠WARNING

Wear safety glasses during the entire setup process!



⚠WARNING

The Model G4791 is a heavy machine. Serious personal injury may occur if safe moving methods are not used. To be safe, get assistance and use power equipment rated for at least 2000 lbs. to move the shipping crate and remove the machine from the crate.

Items Needed for Setup

The following items are needed to complete the setup process, but are not included with your machine:

Description	Qty
• Assistant	1
• Safety Glasses	1 Each
• Machinist's Precision Level	1
• Wrench 24mm	1
• Phillips Screwdriver #2	1
• Lubricant (refer to **Page 54**)	As Needed
• Lifting Straps (rated for at least 2000 lbs.)	2
• Power Lifting Equipment (rated for at least 2000 lbs.)	As Needed

Unpacking

Your machine was carefully packaged for safe transportation. Remove the packaging materials from around your machine and inspect it. If you discover the machine is damaged, *please immediately call Customer Service at (570) 546-9663 for advice.*

Save the containers and all packing materials for possible inspection by the carrier or its agent. *Otherwise, filing a freight claim can be difficult.*

When you are completely satisfied with the condition of your shipment, inventory the contents.

NOTICE

The chip pan and cabinet stand center panel are attached to the inside walls of the shipping crate. When removing the crate top and sides, take care not to damage these parts.

Inventory

The following is a description of the main components shipped with your machine. Lay the components out to inventory them.

Note: *If you can't find an item on this list, check the mounting location on the machine or examine the packaging materials carefully. Occasionally we pre-install certain components for shipping purposes.*

Inventory: (Figures 3–4)	**Qty**
A. Lathe/Mill (not shown)	1
B. Wrenches 8/10mm, 17/19mm	1 Each
C. Drift Key	1
D. Hex Wrenches 3, 4, 5, 6mm	1 Each
E. Spindle Cap	1
F. Dead Center MT#3	1
G. Dead Center MT#5	1
H. Arbor B16-MT#3	1
I. Drill Chuck (B16) & Key	1 Each
J. Crank Handle	1
K. 4-Jaw Chuck (8") & Key	1 Each
L. Faceplate 8"	1
M. 3-Jaw Chuck (6") & Key	1 Each
N. 3-Jaw External Jaw Set	1
O. Center Panel Brackets	2
P. Mounting Bolts $\frac{5}{8}$-13 x $2\frac{1}{4}$"	4
Q. Lathe V-Belt 3L270	1
R. Change Gears 22, 22, 24, 25, 26, 27, 28, 30, 34, 38, 42T	1 Each
S. Steady Rest	1
T. Follow Rest	1
U. Compound Rest & 4-Way Tool Post	1 Each
V. Chip Pan (not shown)	1
W. Cabinet Stand Center Panel (not shown)	1
X. Cabinets Left/Right (not shown)	1 Each
Y. Bolt Bag (for Center Panel, not shown)	
— Phillips Head Screws #8-32 x $\frac{1}{2}$"	16
— Flat Washers #8	16

If any nonproprietary parts are missing (e.g. a nut or a washer), we will gladly replace them; or for the sake of expediency, replacements can be obtained at your local hardware store.

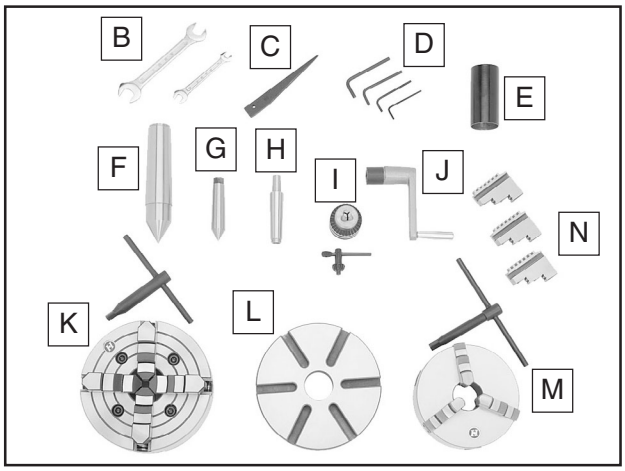


Figure 3. Model G4791 inventory A–M.

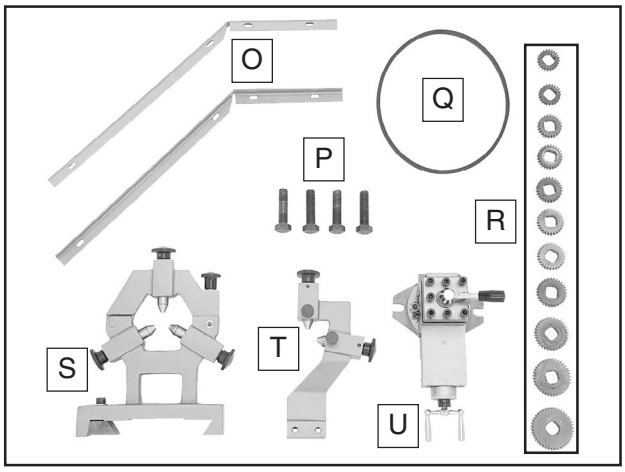


Figure 4. Model G4791 inventory N–U.

⚠WARNING

SUFFOCATION HAZARD!

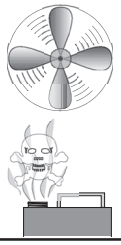
Immediately discard all plastic bags and packing materials to eliminate choking/suffocation hazards for children and animals.

Clean Up

The unpainted surfaces are coated with a waxy oil to prevent corrosion during shipment. Remove this protective coating with a solvent cleaner or degreaser, such as shown in **Figure 5**. For thorough cleaning, some parts must be removed. **For optimum performance, clean all moving parts or sliding contact surfaces.** Avoid chlorine-based solvents, such as acetone or brake parts cleaner that may damage painted surfaces. Always follow the manufacturer's instructions when using any type of cleaning product.

⚠WARNING

Gasoline and petroleum products have low flash points and can explode or cause fire if used to clean machinery. DO NOT use these products to clean the machinery.



⚠CAUTION

Many cleaning solvents are toxic if inhaled. Minimize your risk by only using these products in a well ventilated area.

G2544—Solvent Cleaner & Degreaser
A great product for removing the waxy shipping grease from your machine during clean up.

Figure 5. Cleaner/degreaser available from Grizzly.

Site Considerations

Floor Load

Refer to the **Machine Data Sheet** on **Page 4** for the weight and footprint specifications of your machine. Some residential floors may require additional reinforcement to support both the machine and operator.

Placement Location

Consider existing and anticipated needs, size of material to be processed through each machine, and space for auxiliary stands, work tables or other machinery when establishing a location for your new machine. See **Figure 6** for the minimum working clearances.

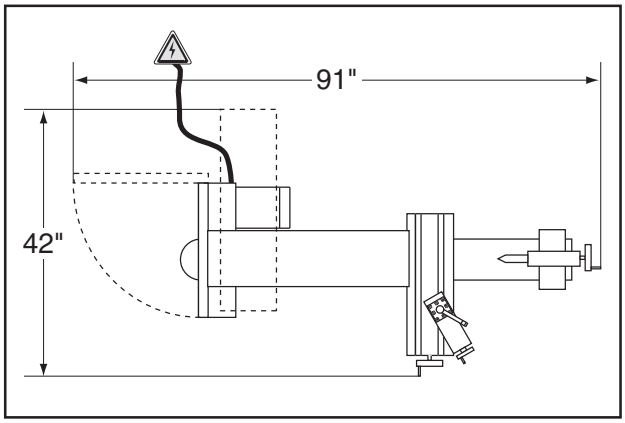
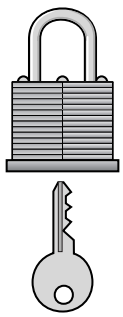


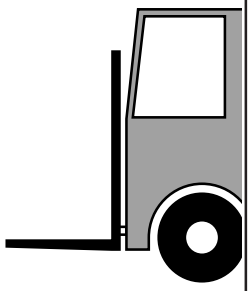
Figure 6. Minimum working clearances.



⚠CAUTION

Children and visitors may be seriously injured if unsupervised around this machine. Lock entrances to the shop or disable start switch or power connection to prevent unsupervised use.

Placement & Assembly



⚠WARNING

The Model G4791 is a heavy machine. Serious personal injury may occur if safe moving methods are not used. To be safe, get assistance and use power equipment rated for at least 2000 lbs. to move the shipping crate and remove the machine from the crate.

To move and assemble your mill/lathe:

1. Use eight #8-32 x ½" Phillips head screws and flat washers to attach the center panel brackets to the sides of the cabinet stands, as shown in **Figure 7**.

   Note: *Leave the screws slightly loose for adjusting the center panel in a later step.*

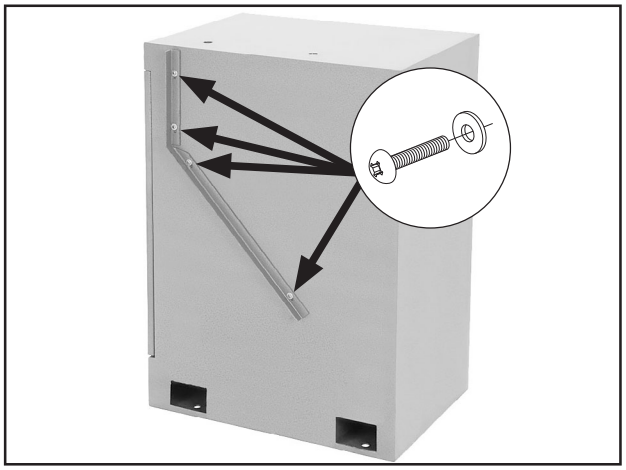


Figure 7. Cabinet stand center panel bracket installed (1 of 2).

2. Position the cabinet stands approximately 28" apart in the prepared location for the machine.

   Note: *Do not mount the cabinet stands to the floor for now so that they can be aligned with the chip pan and machine in the following steps.*

3. Place the chip pan on top of the cabinets and align the mounting holes with those in the cabinets.

4. Remove the steady rest from the machine.

5. Move the tailstock and carriage to the right end of the bedway.

6. Wrap the lifting straps underneath the left side of the base and under the center of the bedway, as shown in **Figure 8**.

   Note: *Place a piece of 2 x 4 between the right lifting strap and the leadscrew to prevent the leadscrew from bending, as shown in* ***Figure 8****.*

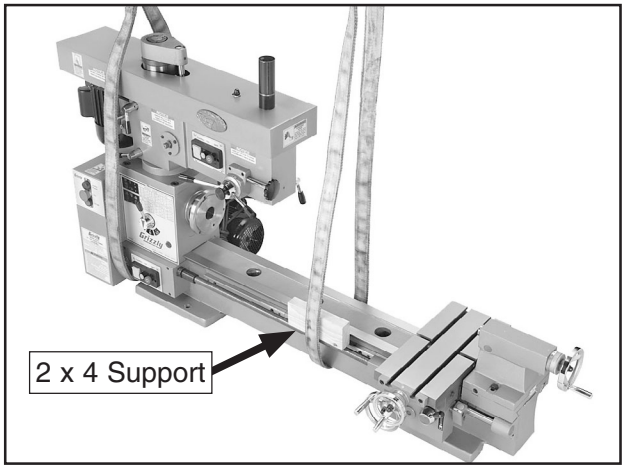


Figure 8. Lifting straps positioned with a 2x4 protecting the leadscrew.

7. Use a 19mm wrench to unbolt the machine from the shipping pallet, then attach the lifting straps to the power lifting equipment.

8. With assistance to balance the load, carefully lift the machine and position it over the cabinet stands.

9. Install the four ⅝-13 x 2¼" hex bolts through the machine base, chip pan, and into the cabinet stands (see **Figure 9**).

   —If you will be mounting the machine to the floor, leave the lifting straps in place to lift and move the assembly during that process.

   Note: *It may be necessary to slightly reposition the cabinets and chip pan during this step.*

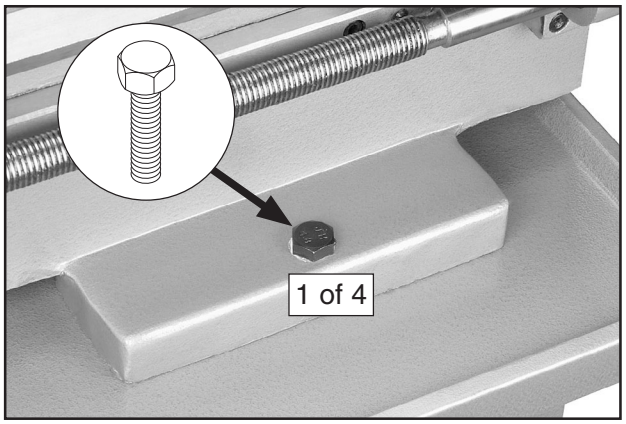


Figure 9. Mounting hex bolt installed (1 of 4).

10. Use the remaining #8-32 x ½" Phillips head screws and flat washers to install the cabinet stand center panel on the brackets, then fully tighten all of the screws.

11. Use a machinist's precision level to make sure the bedway is level side-to-side and front-to-back. If necessary, place shims between the cabinet stands and the floor.

    Note: *Re-check the bedway for levelness after the first 24 hours, the first two weeks, then annually after that.*

Mounting to Shop Floor

Although not required, we recommend that you mount your new machine to the floor. Because this is an optional step and floor materials may vary, floor mounting hardware is not included. Generally, you can either bolt your machine to the floor or mount it on machine mounts. Both options are described below. Whichever option you choose, it is necessary to level your machine with a precision level.

Bolting to Concrete Floors

Anchor studs and lag shield anchors with lag bolts (**Figure 10**) are two popular methods for anchoring an object to a concrete floor. We suggest you research the many options and methods for mounting your machine and choose the best that fits your specific application.

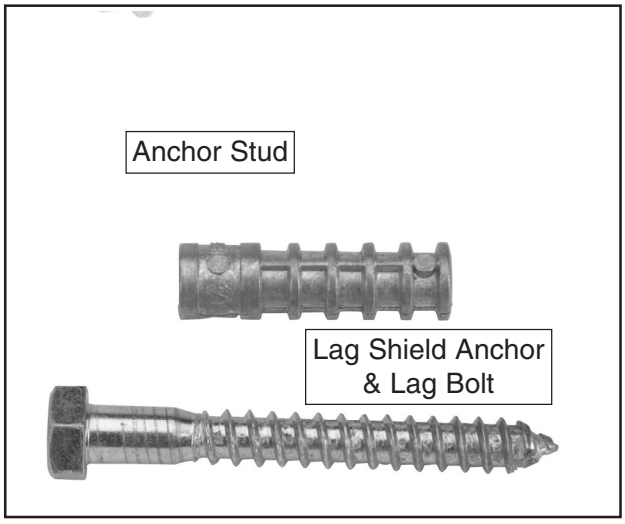


Figure 10. Typical fasteners for mounting to concrete floors.

NOTICE

Anchor studs are stronger and more permanent alternatives to lag shield anchors; however, they will stick out of the floor, which may cause a tripping hazard if you decide to move your machine.

Using Machine Mounts

Using machine mounts, shown in **Figure 11**, gives the advantage of fast leveling and vibration reduction. The large size of the foot pads distributes the weight of the machine to reduce strain on the floor.

Figure 11. Machine mount example.

NOTICE

We strongly recommend securing your machine to the floor if it is hardwired to the power source. Consult with your electrician to ensure compliance with local codes.

Check Gearbox Oil

It is critical that you make sure there is oil in the lathe gearbox before proceeding with the test run. Refer to the **Lubrication** instructions on **Page 54** for more details on which type of oil to use, how much to use, and where to put it.

Test Run

Once the assembly is complete, test run your machine to make sure it runs properly.

If, during the test run, you cannot easily locate the source of an unusual noise or vibration, or a component does not function as it should, stop using the machine immediately, then review the **Troubleshooting** on **Page 61**.

If you still cannot remedy a problem, contact our Tech Support at (570) 546-9663 for assistance.

To test run the machine:

1. Make sure you have read the safety instructions at the beginning of the manual and that the machine is set up properly.

2. Read and understand the **Basic Controls** subsections on **Page 20** and **27**.

3. Perform all lubrication procedures as instructed in the **Lubrication** subsection on **Page 54**.

4. Make sure all tools and objects used during setup are cleared away from the machine.

5. Push the main power EMERGENCY stop button in, then twist it clockwise so it pops out. When the button pops out, the switch is reset and ready for operation (see **Figure 12**).

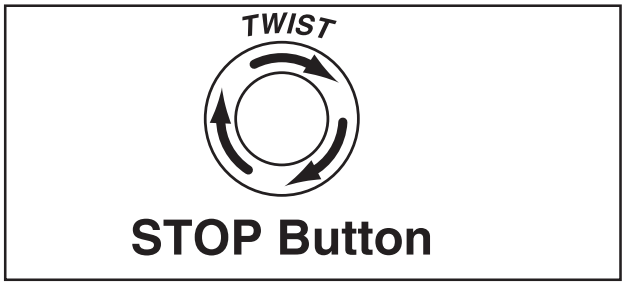


Figure 12. Resetting the main power EMERGENCY stop button.

⚠WARNING

Before starting the machine, make sure you have performed the preceding assembly and adjustment instructions, and you have read through the rest of the manual and are familiar with the various functions and safety features on this machine. Failure to follow this warning could result in serious personal injury or even death!

6. To keep the leadscrew from rotating when the lathe is running, move the feed rate range lever to the vertical so that it points to neutral "**0/N**", as shown in **Figure 13**.

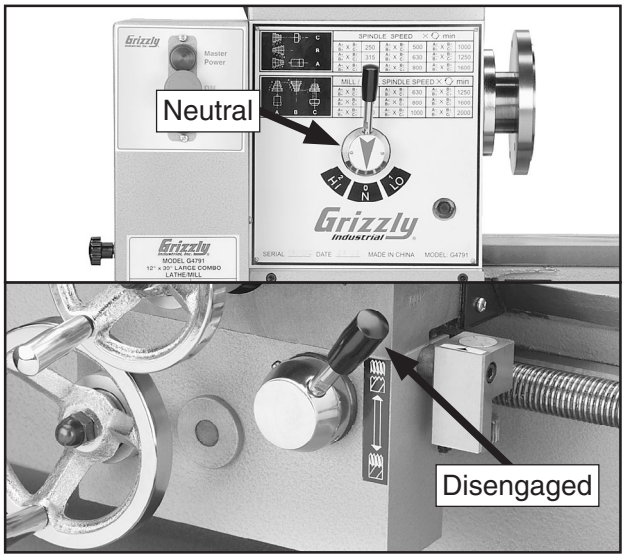


Figure 13. Feed rate range lever and the half-nut lever in the neutral/disengaged position.

7. For further precaution, move the half-nut lever up to the disengaged position to ensure the carriage will not move under power when the lathe is running (**Figure 13**).

8. Connect the machine to power.

9. Press the main power ON button—the main power lamp should light but neither motor should turn ***ON***.

10. One at a time, verify that the lathe and mill are operating correctly by pushing the ON "**I**" button.

—When operating correctly, the machine runs smoothly with little or no vibration or rubbing noises. Press the OFF button to stop the machine.

—Investigate and correct strange or unusual noises or vibrations before operating the machine further. Always disconnect the machine from power when investigating or correcting potential problems.

11. Press the main power EMERGENCY stop button in.

12. WITHOUT resetting the EMERGENCY stop button, press either the lathe or mill ON "**I**" button. The machine should not start.

—If the machine does not start, the EMERGENCY stop button safety feature is working correctly. The Test Run is complete. Proceed to **Spindle Break-In**.

—If the machine does start (with the EMERGENCY stop button pushed in), immediately disconnect power to the machine. The EMERGENCY stop button safety feature is not working correctly. This safety feature must work properly before proceeding with regular operations. Call Tech Support for help.

Spindle Break-In

NOTICE

Successfully complete all of the spindle break-in steps for both the lathe and mill to avoid rapid deterioration of the spindle bearings and other related parts.

To perform the spindle break-in for this machine:

1. DISCONNECT MACHINE FROM POWER!
2. Make sure the machine is properly lubricated (refer to **Lubrication** on **Page 54** for detailed instructions).
3. Configure the mill for the lowest spindle speed (refer to **Setting Mill Speed** on **Page 23** for detailed instructions).
4. Connect the machine to power, then run the mill for 20 minutes.
5. Stop the mill and allow the spindle to completely stop, then use the spindle direction switch to reverse the spindle direction.
6. Run the mill for another 20 minutes.
7. Disconnect the machine from power to configure the next higher mill spindle speed, then repeat **Steps 4–6** for each of the speeds.
8. Make sure the feed rate range lever is in the neutral (center) position, and the half-nut lever is in the disengaged (up) position (see **Figure 13** on **Page 18**).
9. Disconnect the machine from power, configure the lathe for the lowest spindle speed (refer to **Setting Lathe Speed** on **Page 42** for detailed instructions), then repeat **Steps 4–7** for the lathe.
10. Turn the machine ***OFF***. The spindle break-in procedures are complete and your machine is ready for operation.

Recommended Adjustments

For your convenience, the adjustments listed below have been performed at the factory.

However, because of the many variables involved with shipping, we recommend that you at least verify the following adjustments to ensure the best possible results from your new machine.

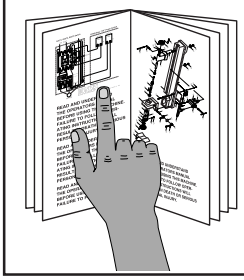
Step-by-step instructions for these adjustments can be found in the **SERVICE** section starting on **Page 61**.

Factory adjustments that should be verified:

- Gib Adjustment (**Page 64**)
- Table Backlash (**Page 65**)

SECTION 4: MILL OPERATIONS

Operation Safety

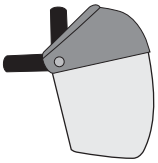


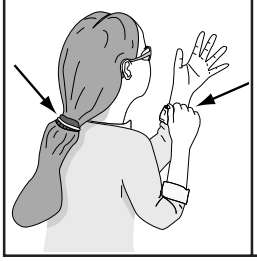
⚠WARNING

To reduce the risk of serious injury when using this machine, read and understand this entire manual before beginning any operations.

⚠WARNING

Damage to your eyes and face could result from using this machine without proper protective gear. Always wear safety glasses or a face shield when operating this machine.





⚠WARNING

Loose hair, clothing, or jewelry could get caught in machinery and cause serious personal injury. Keep these items away from moving parts at all times to reduce this risk.

NOTICE

If you have never used this type of machine or equipment before, WE STRONGLY RECOMMEND that you read books, trade magazines, or get formal training before beginning any projects. Regardless of the content in this section, Grizzly Industrial will not be held liable for accidents caused by lack of training.

Basic Mill Controls

Refer to **Figures 14–15** and the descriptions below to become familiar with the basic controls and components for the mill.

Mill Head

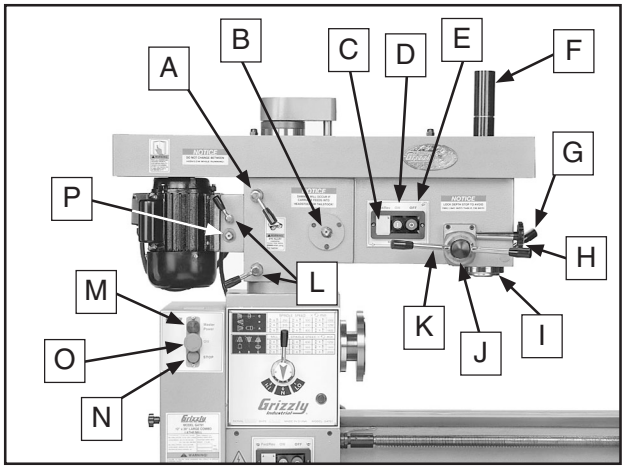


Figure 14. Mill head controls.

A. Motor Lock: Locks the motor in place to properly set the mill drive V-belt tension.

B. Head Elevation Crank: With the use of the crank handle, raises or lowers the mill head.

C. Direction Switch: Reverses the direction of the mill motor and spindle when the spindle is stopped.

D. ON Button: Turns the mill ***ON*** when the machine is connected to power.

E. OFF Button: Turns the mill ***OFF***. This button does not disconnect the machine from power.

F. Spindle Cap: Covers the outboard end of the spindle and drawbar.

G. Quill Lock: Locks the quill and spindle in place. Use this when performing non-drilling operations.

H. Fine Downfeed Knob: Raises or lowers the spindle with slow but more precise control.

I. Quill and Spindle: Holds tooling using an MT#3 taper and the drawbar.

J. Downfeed Selector Knob: Selects fine spindle downfeed (pushed in) or coarse spindle downfeed (pulled out).

K. Coarse Downfeed Lever: Raises or lowers the spindle quickly.

L. Head Locks: Secures the mill head in place on the column. When loose, the mill head can be rotated or raised/lowered.

M. Main Power ON Button: Enables power to flow to the machine.

N. Main Power EMERGENCY Button: Turns power ***OFF*** to the machine. This button does not disconnect the machine from power.

O. Main Power Lamp: Lights when power flows to the machine.

P. Motor Position Crank: With the use of the crank handle, moves the motor when tensioning the mill drive V-belt.

⚠CAUTION

Turning the mill and lathe *ON* at the same time presents an entanglement hazard and could cause serious personal injury or damage to the machine. To prevent this condition, DO NOT have the mill and lathe running at the same time.

Carriage

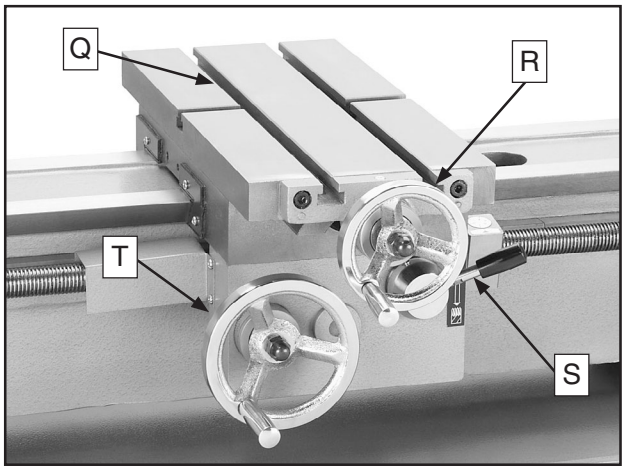


Figure 15. Carriage controls for milling operations.

Q. Table T-Slot: Use standard ½" T-bolts for clamps, vises, and other workpiece holding devices.

R. Table Handwheel: Moves the table in or out perpendicular to the bedway.

S. Half-Nut Lever: Engages/disengages the half-nut to the leadscrew. This lever must be in the disengaged (up) position to move the carriage.

T. Carriage Handwheel: Moves the carriage left or right.

Table Movement

The table has two paths of movement: 1) Longitudinal (X-Axis) controlled by the carriage handwheel, and 2) cross feed (Y-axis) controlled by the table handwheel (see **Figure 16**).

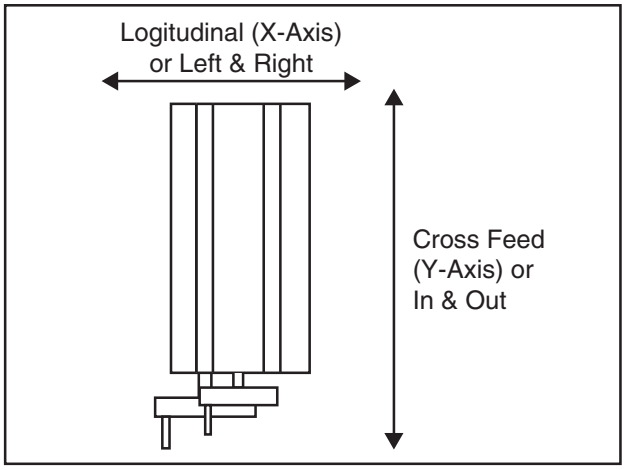


Figure 16. The two paths of table movement.

Handwheel Dial Increments	**Resolution**
Table:	
Each Mark	0.002"
One Revolution	1"
Carriage:	
Each Mark	0.015"
One Revolution	1.105"

The table handwheel dial is a *2:1* dial, which is used primarily in lathe operations. The dial will read *twice* the actual table cross feed travel.

Use the table lock or the carriage on the rear of the table to provide additional rigidity and accuracy when facing (see **Figure 17**).

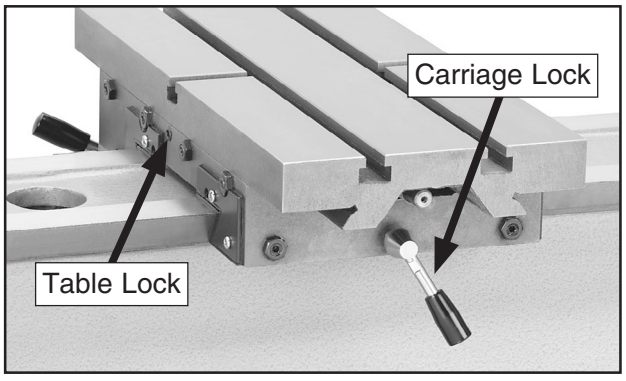


Figure 17. Carriage lock (viewed from the rear of the carriage).

Head Movement

The mill head rotates in a 180° arc around the bedway and elevates 4⅞" up the column.

Rotating the Mill Head

1. DISCONNECT MACHINE FROM POWER!

2. Loosen both column locks (see **Figure 18**).

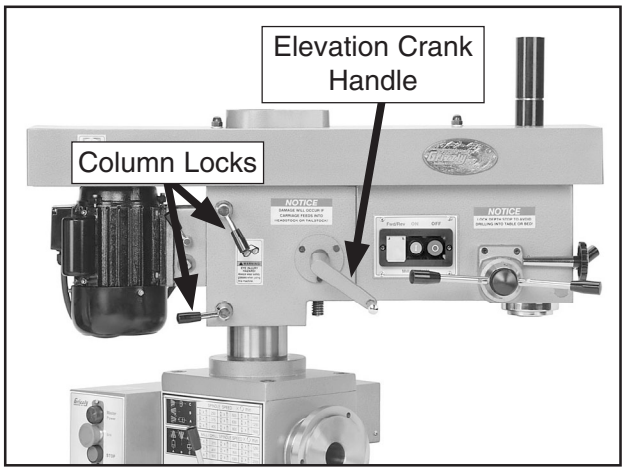


Figure 18. Mill head rotated and elevated.

3. Rotate the mill head by hand, then tighten the column locks to secure it in place.

Elevating the Mill Head

1. DISCONNECT MACHINE FROM POWER!

2. Loosen both column locks.

3. Mount the crank handle on the head elevation axle, as shown in **Figure 18**, then use it raise or lower the mill head.

4. When the mill head is in position, tighten the column locks to secure it.

⚠WARNING

Unexpected head movement when the mill is running can cause the cutting tool to move into the operator or damage the workpiece. ALWAYS tighten the column locks after positioning the mill head and before turning the mill *ON*.

Setting Mill Speed

There are nine mill spindle speeds available by configuring the V-belts under the mill drive system cover.

To select the correct spindle speed (RPM) for your milling operation, you will need to: 1) Determine the spindle speed needed for your workpiece material, and 2) configure the V-belts for the calculated speed.

Calculating Mill Spindle Speed

1. Use the table in **Figure 19** to determine the cutting speed required for your workpiece material.

   Note: *Cutting speed is the rotational speed that the cutter moves over/into the workpiece, and is expressed in surface feet per minute (SFM).*

Cutting Speeds for High Speed Steel (HSS) Cutting Tools	
Workpiece Material	Cutting Speed (SFM)
Aluminum & alloys	300
Brass & Bronze	150
Copper	100
Cast Iron, soft	80
Cast Iron, hard	50
Mild Steel	90
Cast Steel	80
Alloy Steel, hard	40
Tool Steel	50
Stainless Steel	60
Titanium	50
Plastics	300-800
Wood	300-500
Note: *For carbide cutting tools, double the cutting speed. These values are a guideline only. Refer to the MACHINERY'S HANDBOOK for more detailed information.*	

Figure 19. Cutting speed table for HSS cutting tools.

2. Measure the diameter of your cutting tool in inches.

3. Use the following formula to calculate the required spindle speed (RPM) for your operation:

$$\frac{\textbf{Cutting Speed (SFM) x 4}}{\textbf{Tool Diameter (in inches)}} = \textbf{RPM}$$

Configuring Mill V-Belts

1. DISCONNECT MACHINE FROM POWER!

2. Remove the acorn nuts and flat washers securing the mill drive system cover, then remove the cover (see **Figure 20**).

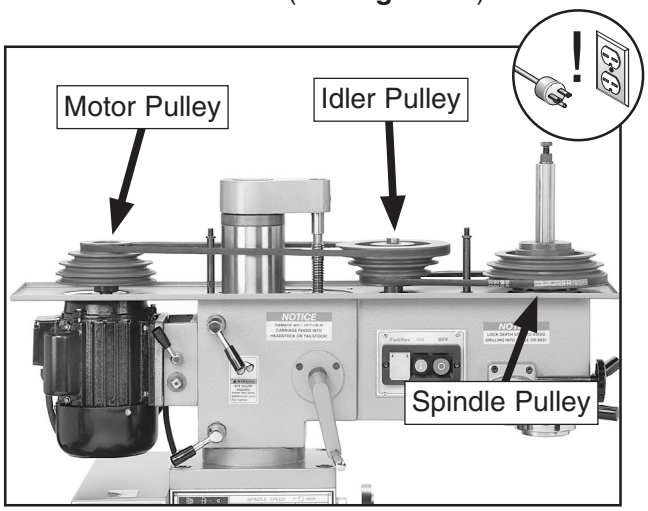
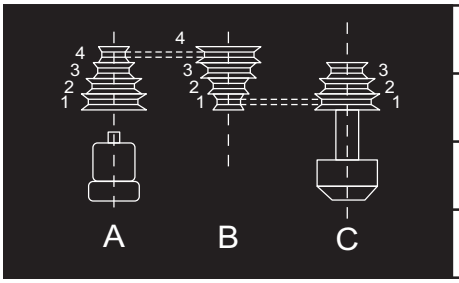


Figure 20. Mill drive system cover removed exposing V-belts and pulleys.

⚠WARNING

The moving V-belts and pulleys of the mill drive system represent a severe entanglement hazard and can cause serious personal injury. ALWAYS have the mill drive system cover in place when the machine is connected to power.



MILL / DRILL SPINDLE SPEED × ↻ / min					
$\frac{A_4}{B_4} \times \frac{B_1}{C_1}$	350	$\frac{A_3}{B_3} \times \frac{B_1}{C_1}$	630	$\frac{A_1}{B_1} \times \frac{B_2}{C_3}$	1350
$\frac{A_4}{B_4} \times \frac{B_2}{C_2}$	400	$\frac{A_3}{B_3} \times \frac{B_2}{C_2}$	800	$\frac{A_2}{B_2} \times \frac{B_3}{C_3}$	1600
$\frac{A_4}{B_4} \times \frac{B_3}{C_3}$	550	$\frac{A_2}{B_2} \times \frac{B_1}{C_1}$	1000	$\frac{A_1}{B_1} \times \frac{B_3}{C_3}$	2000

Figure 21. Mill spindle speed chart.

3. Refer to the mill spindle speed chart in **Figure 21** above to find the nearest speed setting to your calculated speed.

Note: *This chart is also on the front of the machine. In most cases, the calculated spindle speed will be between the available speeds. Use your best judgement when choosing either a higher or lower spindle speed.*

4. Loosen the mill motor lock, then move the motor toward the spindle to relieve tension on the drive V-belt.

5. Configure the V-belts as directed from the speed chart.

6. Move the motor away from the spindle so there is approximately ½" deflection when moderate pressure is placed on the V-belt between the pulleys, then re-tighten the mill motor lock.

7. Re-install and secure the mill drive system cover before connecting the machine to power.

Example with HSS Cutting Tool

If you want to make a surface cut on a hard cast iron workpiece using a ⅝" (0.625") HSS cutter, do the following:

Step 1: Examine the mill cutting speed table in **Figure 19** on **Page 23** to find the recommended cutting speed to be 50 SFM.

Step 2: 50 SFM (from the chart) x 4 = 200

Step 3: 200 / 0.625" (diameter of cutter) = 320

Step 4: Find the nearest mill spindle speed in the spindle speed chart, which is 315 RPM, then note the V-belt configuration in the box to the left of this speed.

Step 5: Configure the drive V-belt on the fourth motor and idler pulleys (A–B), and the spindle V-belt on the first idler and spindle pulleys (B–C), as shown in **Figure 22**.

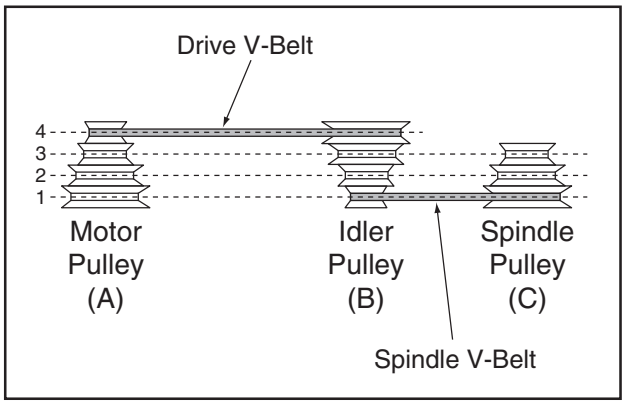


Figure 22. Mill V-belts configured for a mill spindle speed of 315 RPM.

NOTICE

When using a carbide cutting tool, double the cutting speed found in the cutting speed table in *Figure 19* on *Page 23*.

Quill Downfeed

The mill quill downfeed is controlled by the fine downfeed knob or the coarse downfeed levers (see **Figure 23**). The choice is made by moving the downfeed selector knob in or out.

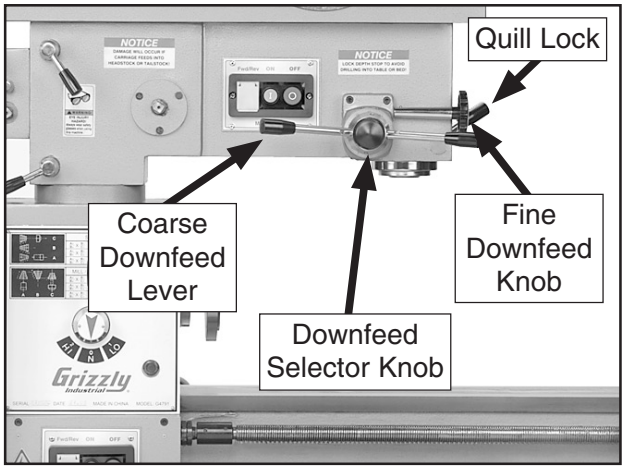


Figure 23. Downfeed controls.

To use the downfeed controls:

1. Loosen the quill lock on the back of the mill head.

2. Use the downfeed selector knob to choose the downfeed control.

   —For slow and precise downfeed control, push the selector knob in, then rotate the fine downfeed knob.

   —For fast downfeed control, pull the selector knob out, then rotate the coarse downfeed levers around the lever hub.

   Note: *It may be necessary to move the quill slightly up or down to push the downfeed selector knob all the way in.*

3. Unless the quill is locked in place, it will automatically return to the upmost position when the downfeed controls are released.

   Note: *Since the spring that automatically raises the quill is fairly strong, we recommend raising the quill in a controlled manner by hand to avoid premature wear to the mechanism.*

Loading & Unloading Mill Tooling

The mill spindle taper is an MT#3 and the drawbar dimensions are M12-1.75 x 13¾". The quill and spindle have drift key slots for removing tooling that does use the drawbar.

Tools Needed	Qty
Wrench 17mm	1
Wrench 19mm	1

Loading Tooling With Drawbar

1. DISCONNECT MACHINE FROM POWER!

2. Clean any debris or oily substances from the mating surfaces of the spindle and tool tapers.

3. Insert the tool into the spindle, insert the drawbar through the spindle top, as shown in **Figure 24**, then thread the drawbar into the tool.

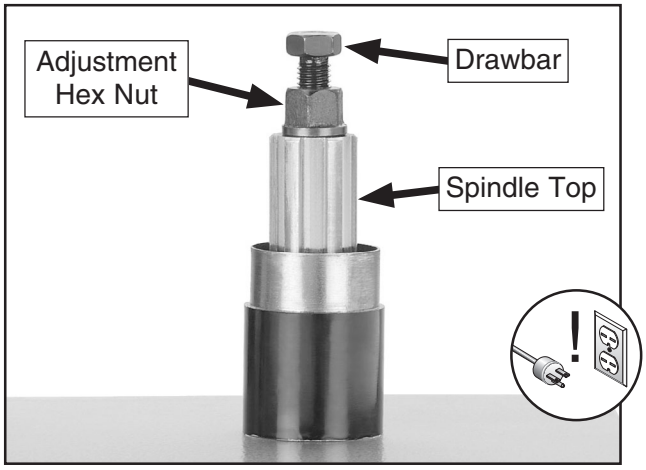


Figure 24. Drawbar inserted through the spindle top.

4. Tighten the drawbar into the tool until it is snug, then thread the adjustment hex nut down to secure the drawbar.

   Note: *Over-tightening the drawbar could make removing the tool difficult.*

Unloading Tooling With the Drawbar

1. DISCONNECT MACHINE FROM POWER!

2. Unthread the drawbar 2–3 turns.

3. Tap the top of the drawbar with a dead-blow hammer to release the tool from the spindle taper.

4. Keep one hand on the tool, then completely unthread the drawbar and remove the tool.

Unloading Tooling With the Drift Key

1. DISCONNECT MACHINE FROM POWER!

2. Lower the quill until you can access the drift key slot in the side of the quill, as shown in **Figure 25**, then lock the quill in place.

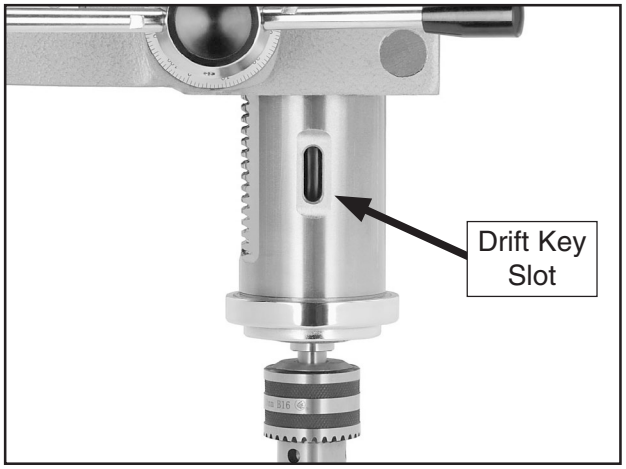


Figure 25. Drift key slot in quill and spindle aligned.

3. Rotate the spindle by hand until the slots in the quill and spindle are aligned.

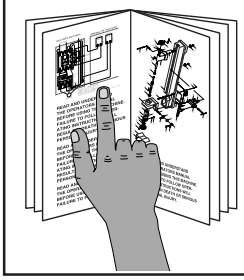
4. Hold the tool with your hand, then push the drift key, flat side down, through the slot until the tool releases.

⚠CAUTION

Cutting tools are sharp and can quickly injure your hands. Always protect your hands when handling cutting tools.

SECTION 5: LATHE OPERATIONS

Operation Safety

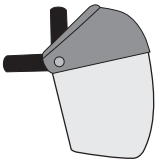


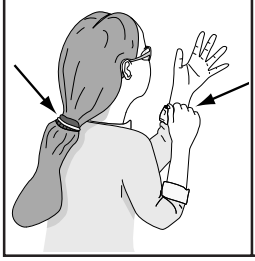
⚠WARNING

To reduce the risk of serious injury when using this machine, read and understand this entire manual before beginning any operations.

⚠WARNING

Damage to your eyes and face could result from using this machine without proper protective gear. Always wear safety glasses or a face shield when operating this machine.





⚠WARNING

Loose hair, clothing, or jewelry could get caught in machinery and cause serious personal injury. Keep these items away from moving parts at all times to reduce this risk.

NOTICE

If you have never used this type of machine or equipment before, WE STRONGLY RECOMMEND that you read books, trade magazines, or get formal training before beginning any projects. Regardless of the content in this section, Grizzly Industrial will not be held liable for accidents caused by lack of training.

Basic Lathe Controls

Refer to **Figures 26–28** and the descriptions below to become familiar with the basic controls and components for the lathe.

Lathe Head

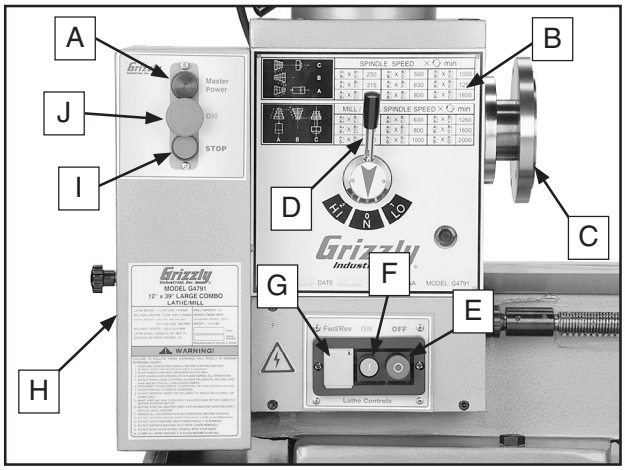


Figure 26. Lathe controls.

A. Main Power Lamp: Lights when there is power flowing to the machine.

B. Spindle Speed Charts: Provide spindle speed configuration information.

C. Spindle Back Plate: Mounts chucks and faceplates to the lathe spindle.

D. Feed Rate Range Lever: Shifts the feed rate range from high or low speed range, or neutral.

E. OFF Button: Turns the lathe ***OFF.***

F. ON Button: Turns the lathe ***ON*** when the machine is connected to power.

G. Spindle Direction Switch: Reverses the direction of the lathe motor and spindle when the spindle is stopped.

H. Change Gear Cabinet: Contains the V-belts and pulleys that regulate the spindle speed, and the change gears that determine the threading feed rate.

I. Main Power ON Button: Turns power ***ON*** to the machine.

J. Main Power EMERGENCY Button: Turns power ***OFF*** to the machine. This button does not disconnect the machine from power.

Carriage

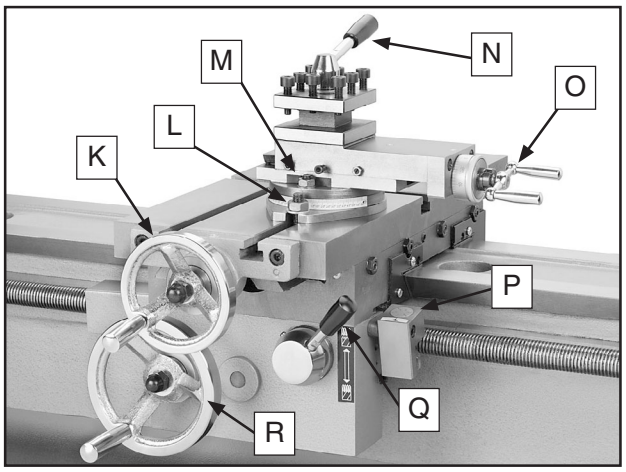


Figure 27. Carriage controls for lathe operations.

K. Table (Cross Feed) Handwheel: Moves the table in or out perpendicular to the bedway and workpiece.

L. Compound Slide Mounting Bolt: Secures the compound slide to the table.

M. Compound Slide Rotational Adjustment Nut: When loose, allows the compound slide and mounted tooling to rotate in any angle against the workpiece.

N. 4-Way Tool Post: Holds up to four cutting tools that can be rotationally indexed to the workpiece.

O. Compound Slide Handwheel: Moves the compound slide and mounted tooling toward or away from the workpiece at the configured angle.

P. Thread Dial: Shows when to engage the half-nut with the leadscrew during inch threading operations.

Q. Half-Nut Lever: Opens and closes the half-nut on the leadscrew, which moves the tooling at a pre-determined rate for threading.

R. Carriage (Longitudinal) Handwheel: Moves the carriage left or right.

Tailstock

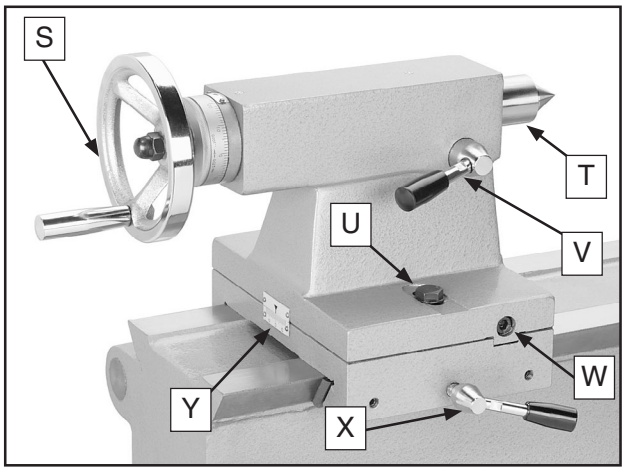


Figure 28. Tailstock components.

S. Tailstock Quill Handwheel: Moves the quill toward or away from the spindle.

T. Tailstock Quill: Holds MT#3 centers or tooling that can be moved into the workpiece mounted on the spindle.

U. Offset Locking Bolt: Secures the tailstock offset.

V. Quill Lock Lever: Locks the quill in place.

W. Offset Adjustment Cap Screw: Moves the tailstock for offset adjustments (1 of 2).

X. Tailstock Lock Lever: Secures the tailstock in place along the bedway.

Y. Offset Scale: Indicates the amount the tailstock is offset from center.

Mounting/Removing Chuck or Faceplate

The Model G4791 lathe/mill ships with a 6" 3-jaw chuck installed on the spindle, but also includes an 8" 4-jaw chuck and an 8" faceplate. The chucks and faceplate mount to the spindle back plate in the same manner.

Before installing or storing the chucks or faceplate, clean away debris and grime, then apply a protective coat of a product such as Primrose Armor Plate to avoid rust and corrosion (refer to **ACCESSORIES** on **Page 50**).

Tools Needed	**Qty**
Wrench 14mm	1
Chuck Cradle or Piece of Plywood	1
Rubber or Wooden Mallet	1

Mounting a Chuck or Faceplate

1. DISCONNECT MACHINE FROM POWER!

2. Lay a chuck cradle (see **Figure 29**) or a piece of plywood over the bedways below the lathe spindle to reduce the risk of injury and to protect the precision ground surfaces of the bedway.

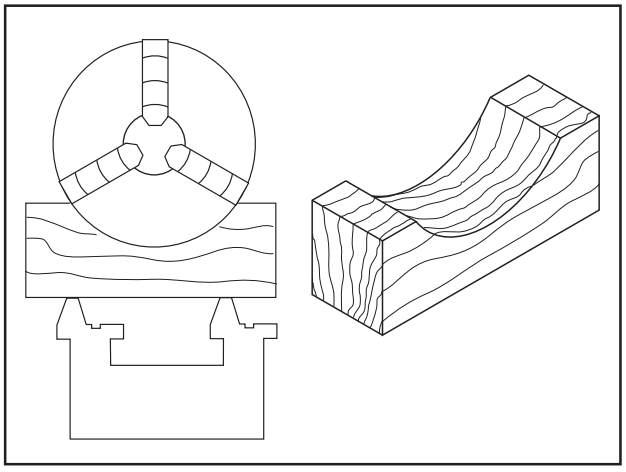


Figure 29. Simple chuck cradle made from scrap lumber.

3. Clean the mating surfaces of the spindle back plate and chuck or faceplate with a clean paint brush or rag, then wipe the surfaces with your hand. If there is grit on the surfaces you will be able to feel it. Keep wiping until the surfaces are clean.

⚠CAUTION

Debris or grit on the mating surfaces will not allow the chuck or faceplate to evenly seat onto the spindle back plate. This condition could allow the chuck or faceplate to vibrate loose during use and cause serious personal injury. A wobbling workpiece also degrades the accuracy of the operation.

4. Place a mounting hex bolt into one of the holes in the spindle back plate.

5. With assistance, lift the chuck up to the plate and align the threaded hole in the back of the chuck or faceplate with the bolt (see **Figure 30**).

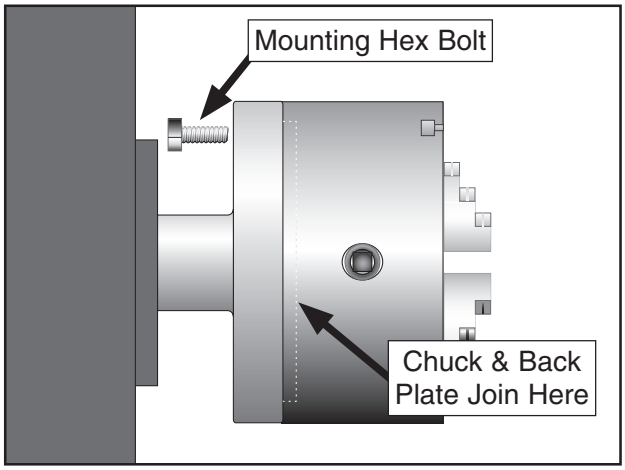


Figure 30. Chuck and spindle back plate.

6. While supporting the weight of the chuck, thread the mounting bolt into the chuck or faceplate and hand-tighten it until it is slightly snug. DO NOT fully tighten it at this time.

7. Rotate the chuck or faceplate and repeat **Step 6** with the remaining two bolts.

8. Return to the first bolt and tighten it a little more, then tighten the other bolts the same amount.

   Note: *The goal is to keep the gap between the back plate and chuck or faceplate even around the circumference while you bring them together.*

9. Finally, tighten all three bolts until the gap between the back plate and the chuck or faceplate is closed and the bolts are tight.

Mounting a Chuck or Faceplate

1. DISCONNECT MACHINE FROM POWER!

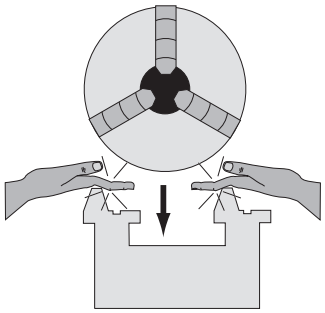
2. Lay a chuck cradle (see **Figure 29**) or a piece of plywood over the bedways below the lathe spindle to reduce the risk of injury and to protect the precision ground surfaces of the bedway.

3. Locate the three mounting hex bolts on the back of the spindle back plate and remove two of them.

4. Loosen the last bolt, then tap the edge of the chuck or faceplate with a mallet to loosen the seal between the back plate and the chuck or faceplate.

5. With assistance to support the assembly, remove the last screw and the chuck or faceplate.

⚠WARNING



PINCH HAZARD! Get assistance and protect your hands and the precision ground bedways with plywood or a chuck cradle when removing the lathe chuck! The heavy weight of a falling chuck can cause serious injury.

3-Jaw Chuck

The 3-jaw chuck supplied with your lathe/mill comes with two sets of jaws, which are depicted in **Figure 31**. These are commonly known as the internal and external jaws.

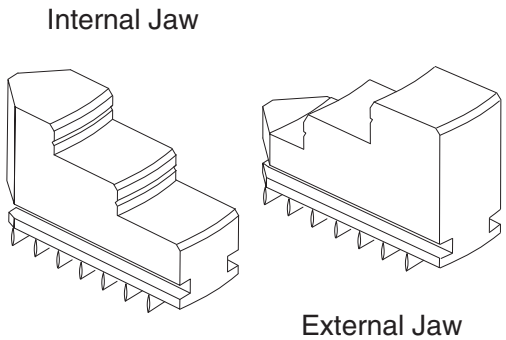


Figure 31. Internal and external jaws for the 3-jaw chuck.

Both sets of jaws can hold a workpiece on the inside or outside surface of the jaw (see **Figure 32** for examples). Use your best judgement when configuring the jaws to firmly secure the workpiece to the chuck.

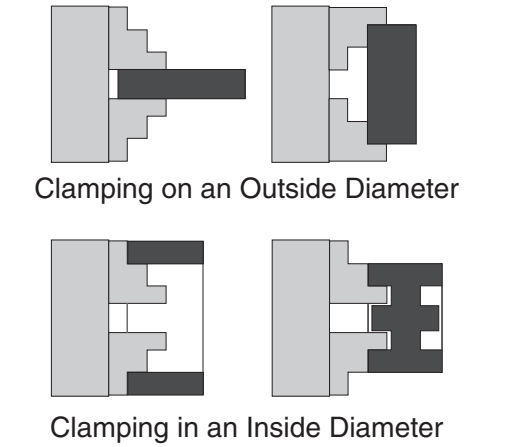


Figure 32. Examples of using internal and external jaws in the 3-jaw chuck.

Tools Needed	Qty
3-Jaw Chuck Key	1
Piece of Plywood	1

Mounting Workpiece in 3-Jaw Chuck

1. DISCONNECT MACHINE FROM POWER!

2. Place a piece of plywood under the chuck to protect the bedways.

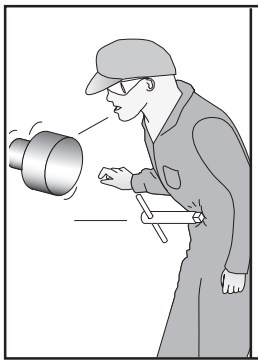
3. Use the chuck key to open the jaws until the workpiece sits flat against the chuck face, lays evenly on the jaw steps, or fits in the chuck hole.

4. Close the jaws until they make light contact with the workpiece.

5. Rotate the chuck by hand to make sure all three jaws evenly contact the workpiece and the workpiece is centered.

   —If the workpiece is off center or the jaws do not evenly contact the workpiece, loosen the jaws and adjust the workpiece.

   —If the workpiece is centered, fully tighten the jaws.



⚠WARNING

Securely clamp your workpiece and remove the chuck key! Thrown objects from a lathe can cause serious injury or death to the operator and to bystanders many feet away.

Removing Jaws from 3-Jaw Chuck

1. DISCONNECT MACHINE FROM POWER!

2. Place a piece of plywood under the chuck to protect the bedways.

3. Insert and turn the chuck key counterclockwise to back the jaws all the way out of the chuck.

   Note: *Each jaw will move until it becomes loose from the scroll gear threads, then it can be removed by hand.*

4. Thoroughly clean the jaws, then apply a protective coat of a product such as Primrose Armor Plate to avoid rust and corrosion (refer to **ACCESSORIES** on **Page 50**).

Installing Jaws into 3-Jaw Chuck

1. DISCONNECT MACHINE FROM POWER!

2. Thoroughly clean debris and grime from the jaws and chuck jaw guides, then apply a thin film of lubricant to the mating surfaces.

3. Examine the jaws and the chuck jaw guides. Each is stamped with a number 1–3.

4. Locate the #1 jaw guide and jaw, then insert and rotate the chuck key clockwise until you see the beginning of the scroll gear lead thread come into view through the jaw guide, then back it off slightly until it disappears (see **Figure 33**).

Figure 33. Installing #1 jaw in the 3-jaw chuck.

5. Slide the #1 jaw into the jaw guide and hold it firmly against the scroll gear threads, then rotate the chuck clockwise a couple of turns to send the lead thread through the jaw.

6. Repeat **Steps 4–5** for jaw #2 and #3 in sequence.

—If installed correctly, the three jaws will converge evenly at the center of the chuck.

—If the jaws do not come together evenly, remove them, make sure the numbers of the jaws and jaw guide match, then re-install the jaws.

It is important to follow these points when replacing jaws in your 3-jaw chuck:

- The jaws must be loaded in sequence beginning with jaw #1.
- The chuck, scroll gear threads, and jaws should be thoroughly cleaned before assembly. A clean, dry paint brush works great for cleaning hard-to-get areas.
- Never use a combination of internal and external jaws to hold a workpiece. This configuration will not hold the workpiece evenly.
- DO NOT over-tighten the chuck jaws. Damage will occur, resulting in loss of accuracy.
- DO NOT load the jaws into the chuck incorrectly to do eccentric or off-center turning. Use a 4-jaw chuck or faceplate for these purposes.
- A 3-jaw chuck will always have a little run out. If a greater degree of accuracy is desired, replace the 3-jaw chuck with the 4-jaw chuck, and adjust the workpiece position using a test indicator.

4-Jaw Chuck

The 4-jaw chuck included with the lathe/mill features independently adjustable hardened steel jaws. Each jaw can be removed from the chuck body and reversed for a wide range of work holding configurations. Install the 4-jaw chuck on the spindle back plate according to the instructions on **Page 29**.

Tools Needed	**Qty**
4-Jaw Chuck Key	1

To mount a workpiece in the 4-jaw chuck:

1. DISCONNECT MACHINE FROM POWER!

2. Place a piece of plywood below the chuck to protect the bedways.

3. Use the chuck key to open each jaw until the workpiece can lie flat against the chuck face or evenly on the jaw steps.

4. With assistance to hold the workpiece in place, tighten each jaw in small increments.

5. After adjusting the first jaw, continue tightening in opposing sequence, as shown in **Figure 34**, until the workpiece is firmly secure in the desired position.

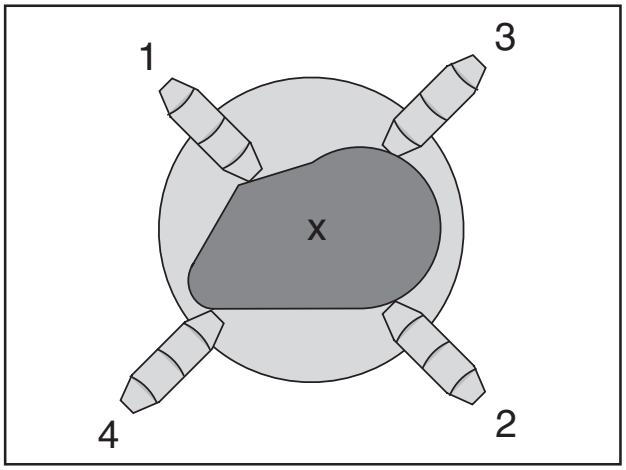


Figure 34. Tightening sequence for the 4-jaw chuck.

6. Make accurate adjustments to the workpiece position by using a test indicator and adjusting the jaws until the workpiece is precisely aligned (see **Figure 35** for an example).

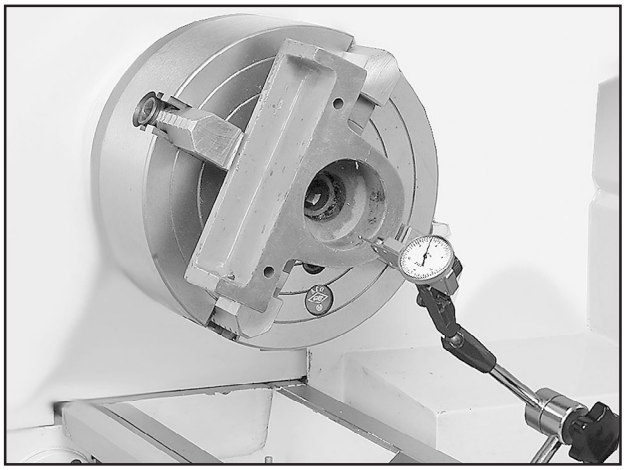


Figure 35. Example of aligning workpiece with a test indicator on a 4-jaw chuck.

⚠WARNING

Always use a low spindle speed when machining non-cylindrical or off-center workpieces to avoid ejecting the workpiece from the holding device at a high rate of speed. Failure to heed this warning could lead to serious personal injury, death or property damage.

Faceplate

The faceplate can be used for mounting non-cylindrical parts or for off-center turning by clamping the workpiece to it. Refer to the **ACCESSORIES** section on **Page 50** for clamping options.

To mount a workpiece to the faceplate:

1. DISCONNECT MACHINE FROM POWER!

2. Place a piece of plywood under the faceplate to protect the bedways.

3. With assistance, place the workpiece onto the faceplate and clamp it tightly in place with a minimum of three independent clamping devices (see **Figure 36** for an example).

   Note: *Take into account the rotation and cutting forces that will be applied to the workpiece when clamping it to the faceplate.*

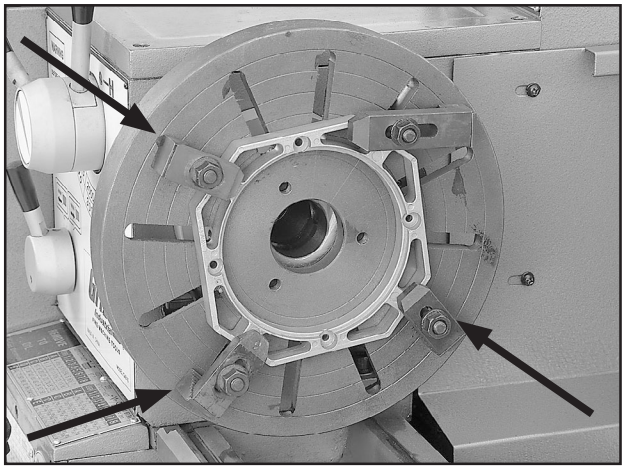


Figure 36. Example of the faceplate with properly mounted workpiece clamped in four locations.

Centers

The Model G4791 lathe/mill includes an MT#3 dead center for the tailstock quill and an MT#5 dead center for the lathe spindle.

A dead center installed in the tailstock quill is used to support stock that is too long to be supported by the chuck alone. Stock protruding more than 2½ times its diameter from the chuck jaws should be supported by a center (see **Figure 37** for an example).

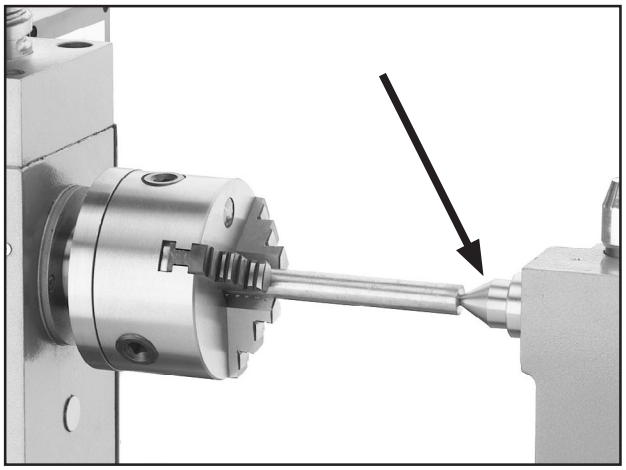


Figure 37. Dead center mounted in the tailstock.

Dead centers are also installed in the lathe spindle and used with the chuck or faceplate and a lathe dog (see **Figure 38**).

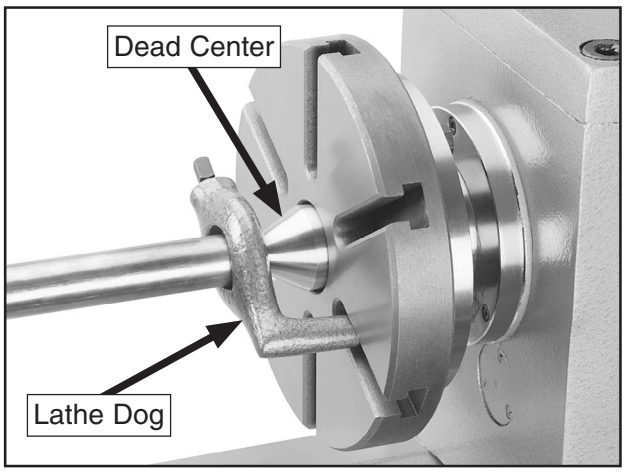


Figure 38. Stock supported between centers using a chuck and lathe dog on the spindle.

Matching tapers in the spindle and tailstock quill provide the locking action for installing the centers. Before inserting the center, thoroughly clean away any grime or grit from the mating surfaces. If grit or oil is present on these mating surfaces, the tapers will not interlock properly or the centers will be very difficult to remove. These parts will last long and remain accurate if properly maintained.

Since the dead center does not rotate with the workpiece, the tip of the center must be lubricated with an anti-sieze lubricant to avoid premature wear and maximize smooth operation.

The dead center is used with the idea of achieving a more accurate finished product but requires keeping the spindle speed low to avoid heat from friction damaging the center or workpiece. For a slight bit of accuracy loss and a large gain in time, the live center can be used. The live center has bearings that allow the center and the workpiece to rotate together, instead of the workpiece rotating on the tip of the dead center. Refer to the **ACCESSORIES** section on **Page 50** for live center options.

Using a Dead Center in the Spindle

1. DISCONNECT MACHINE FROM POWER!

2. Thoroughly clean the mating surfaces of the spindle and the MT#5 dead center, then insert the center into the spindle through the chuck or faceplate.

3. Install a lathe dog on the workpiece, then mount the workpiece between the spindle and tailstock centers with the lathe dog inserted into the chuck or faceplate (see **Figure 38**).

4. To remove the center from the spindle, insert a piece of round bar stock or similar tool through the outboard end of the spindle (on the left side of the lathe head), then tap the center loose.

   Note: *Hold onto the center as you tap it loose to avoid dropping it and damaging the tip or the bedways.*

Using a Dead Center in the Tailstock

1. Feed the tailstock quill out approximately ½", then thoroughly clean the mating surfaces of the quill and the MT#3 dead center.

   Note: *For stability and accuracy, the tailstock quill with the dead center mounted should protrude between ½" and 1¼".*

2. Seat the center into the quill, position the tailstock so the center presses against the workpiece, then lock the tailstock in place.

3. Use the quill handwheel to feed the dead center further into the workpiece until it is snug, then lock the quill in place.

   Note: *The force against the mounted workpiece will fully seat the center's taper. However, do not overly force the center into the workpiece—this will make removing the center very difficult.*

4. To remove the center from the quill, hold on to the center with one hand, then use the quill handwheel to retract the quill back into the tailstock until the center releases.

Offsetting Tailstock

The tailstock can be offset slightly to cut shallow tapers. When the tailstock is positioned toward the operator from the spindle center line, the machined workpiece will be smaller at the tailstock end. Conversely, if the tailstock is positioned away from the operator, the taper will be at the spindle end.

Tools Needed	Qty
Hex Wrench 6mm	1
Wrench 17mm	1

To set the tailstock offset:

1. Loosen both offset locking bolts (see **Figure 39**).

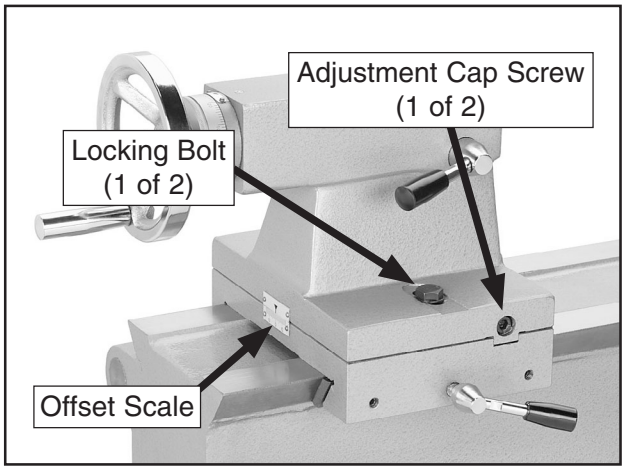


Figure 39. Tailstock offsetting components.

2. Alternately loosen and tighten the two adjustment cap screws until the desired offset is indicated on the offset scale, then re-tighten the locking bolts.

3. To return the tailstock back to the original position, repeat the process until the centered position is reached, then perform the **Aligning Tailstock** instructions on **Page 36**.

Aligning Tailstock

The tailstock alignment with the headstock was set at the factory. However, we recommend that you take the time to ensure that the tailstock is aligned to your own desired tolerances.

To align the tailstock:

1. Use a machinist's precision level on the bedways to ensure the lathe is level side-to-side and front-to-back. If the lathe is not level, correct this condition before proceeding (refer to **Page 16** for additional information).

2. Center drill a 6" long piece of round bar stock on both ends. Set it aside for use in **Step 5**.

   Note: *If the tailstock is slightly out of alignment by a few thousands of an inch, the center drill will find the center point during the drilling process. If the tailstock appears grossly out of alignment, move the tailstock until it appears to be centered (refer to the previous subsection for detailed instructions).*

3. Make a dead center by turning a shoulder on a similar piece of round bar stock, then flip the piece over in the chuck and turn a 60° point (see **Figure 40**).

   Note: *As long as the fabricated dead center remains in the chuck, the point of this center will remain true to the spindle axis or center line. Keep in mind that the point will have to be re-finished whenever it is removed and re-installed in the chuck.*

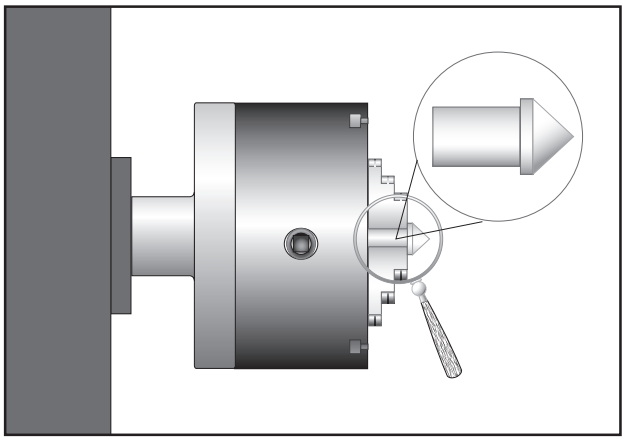


Figure 40. Fabricating the dead center.

4. Install the MT#3 dead center in the tailstock quill and lubricate the tip.

5. Attach a lathe dog at the spindle end of the bar stock from **Step 2**, then mount it between the centers (see **Figure 41** for an example).

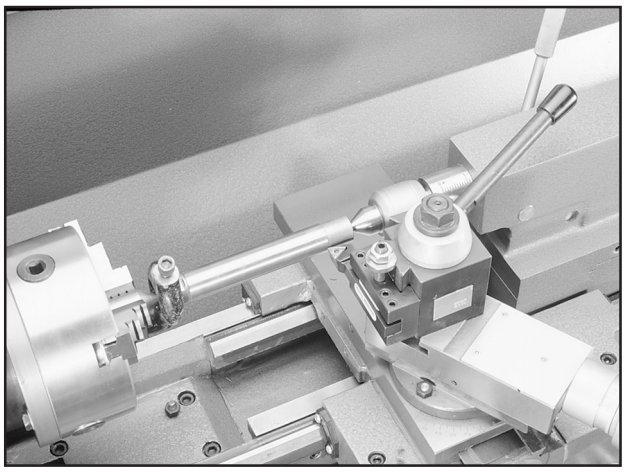


Figure 41. Bar stock mounted between centers.

6. Turn approximately 0.010" off the diameter of the entire length of the workpiece.

7. Mount a dial indicator so that the plunger is on the tailstock barrel.

8. Measure the diameters of both ends of the workpiece.

   —If the machined workpiece is *thicker* at the tailstock end, move the tailstock *toward* the operator *half* the distance of the amount of taper (see **Figure 42**).

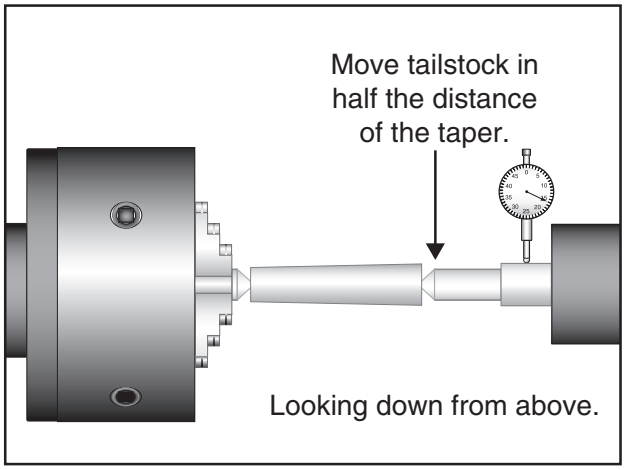


Figure 42. Tailstock adjustment toward the operator (viewed from above).

—If the machined workpiece is *thinner* at the tailstock end, move the tailstock *away* from the operator *half* the distance of the mount of taper (see **Figure 43**).

Note: *Refer to* ***Offsetting Tailstock*** *on* ***Page 35*** *for making adjustments to the tailstock position.*

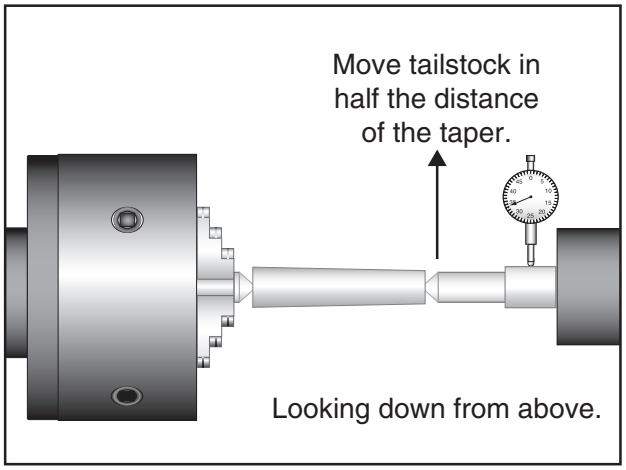


Figure 43. Tailstock adjustment away from the operator (viewed from above).

9. Turn another 0.010" off the diameter of the workpiece, then re-check the taper. Repeat this process as necessary until the desired amount of accuracy is achieved.

Drilling with Tailstock

The tailstock can be used to drill holes by advancing a drill bit installed in the tailstock into a rotating workpiece mounted on the lathe spindle.

Your lathe/mill is supplied with an MT#3–B16 arbor and a B16 drill chuck. Thoroughly clean away grit and oil from all mating surfaces, seat the large end of the arbor into the drill chuck, then install the other end of the arbor into the tailstock quill.

Because the small end of the drill chuck arbor that is seated in the tailstock quill is threaded, removal from the quill requires the use of a mallet and a wooden dowel, as shown in **Figure 44**. Have an assistant hold on to the chuck to prevent damage to it or the machine when it leaves the quill.

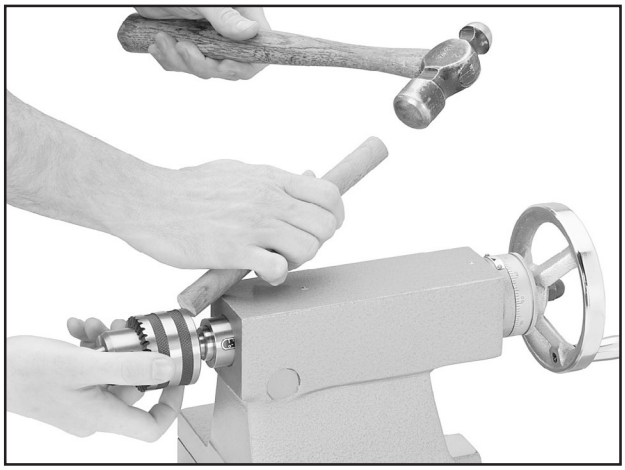


Figure 44. Removing the drill chuck from the tailstock quill.

Tap along the back edge of the drill chuck on one side then the other until the drill chuck and arbor releases from the quill.

Drill chuck arbors with a standard tang (or flat key) on the small end allow the operator to simply turn the tailstock handwheel counterclockwise until the drill chuck arbor loosens from the taper.

Follow Rest

The follow rest is used on long narrow stock to help keep deflection to a minimum. In normal use, the cutter applies pressure to the workpiece. In the case of slender parts, there is a tendency for the workpiece to deflect away from the cutter. The follow rest reduces deflection because the brass fingers of the rest support the workpiece near the point of contact with the cutter (see **Figure 45**).

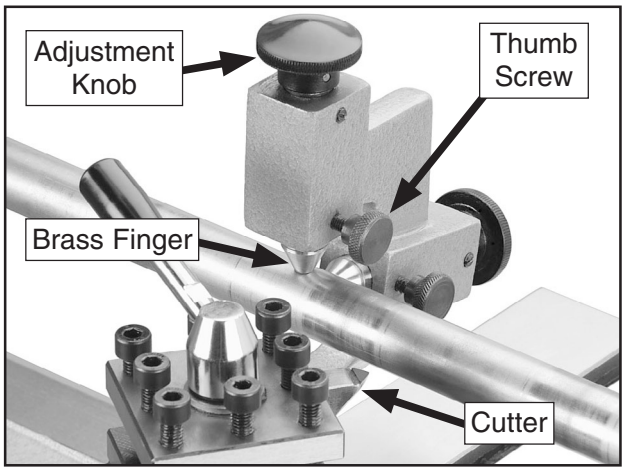


Figure 45. Follow rest setup.

Tools Needed **Qty**
Hex Wrench 6mm..... 1

To use the follow rest:

1. Attach the follow rest to the leading edge of the saddle.

2. Loosen the knurled thumb screws for each brass finger, then turn the adjustment knobs counterclockwise to allow plenty of clearance for the workpiece.

3. Properly secure the workpiece between centers or a chuck and tailstock center.

4. Lubricate the brass fingers with an anti-sieze grease prior to seating them on the workpiece and during use to reduce wear and heat from friction.

5. Adjust the brass fingers until they lightly touch the workpiece, then tighten the thumb screws to secure the settings.

   Tip: *To further avoid deflection of the workpiece during setup, use the method shown in **Figure 46**. The test indicator is set directly opposite the brass fingers on the workpiece, then the brass finger is moved into the workpiece until the dial on the indicator begins to move. Back the finger away from the workpiece until the indicator dial stops moving. Adjust each of the fingers in the same way.*

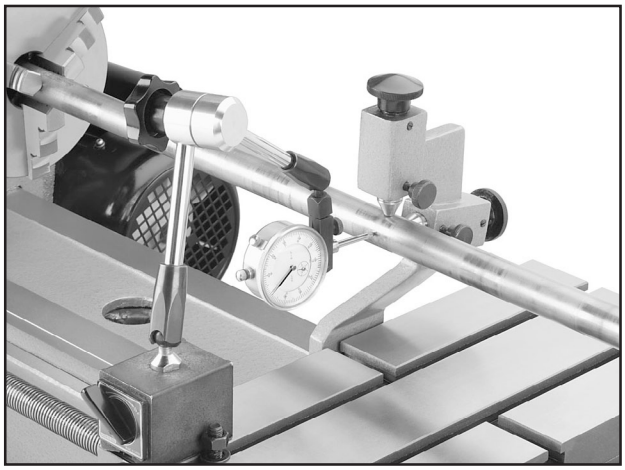


Figure 46. Adjusting the brass finger with a test indicator (for clarity, shown without tailstock center supporting the workpiece).

Steady Rest

The steady rest is used for the same reasons as the follow rest and when support is needed for a workpiece that cannot be supported by a center in the tailstock. This is especially useful when the end of a long workpiece is to be faced.

Tools Needed **Qty**
Hex Wrench 8mm..... 1

To use the steady rest:

1. Remove the cap screw and clamp shoe from the steady rest base (see **Figure 47**), place the steady rest on the bedway, then re-install the clamp shoe to secure it in place.

   —If the end of the workpiece is to be faced, place the steady rest on the left side of the carriage.

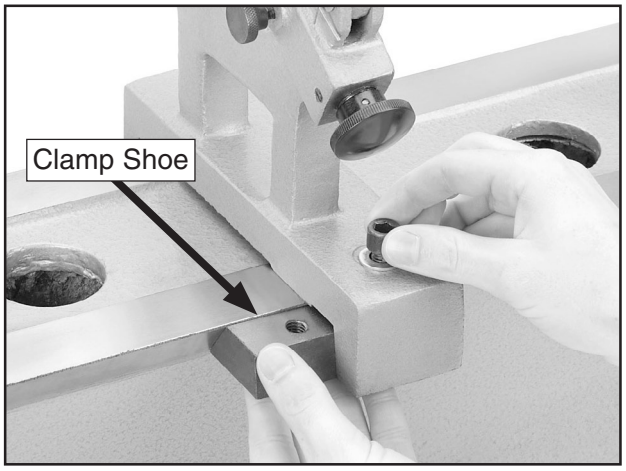


Figure 47. Installing steady rest clamp shoe.

2. Loosen the knurled thumb screws for each brass finger, then turn the adjustment knobs counterclockwise to allow plenty of clearance for the workpiece.

3. Loosen the head lock, rotate it down, then pivot the steady rest head up and out of the way (see **Figure 48**).

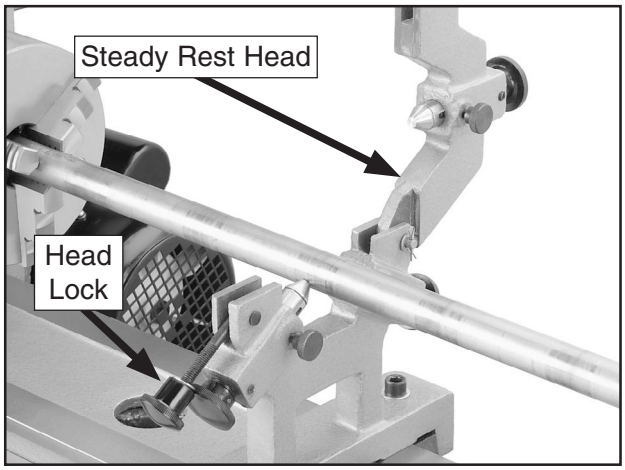


Figure 48. Positioning the workpiece into the steady rest.

4. Lubricate the brass fingers with anti-sieze grease, then load the workpiece in the chuck and onto the steady rest fingers.

5. Close and secure the steady rest head.

6. Adjust the brass fingers until they lightly touch the workpiece, then tighten the thumb screws to secure the settings.

   Note: *See the **Tip** on **Page 38** for a method to further minimize deflection during steady rest setup.*

Carriage

Handwheel Dial Increments	Resolution
Each Mark	0.015"
One Revolution	1.105"

The carriage consists of the apron, saddle, cross slide (table), the compound slide, and the tool post (see **Figure 49**).

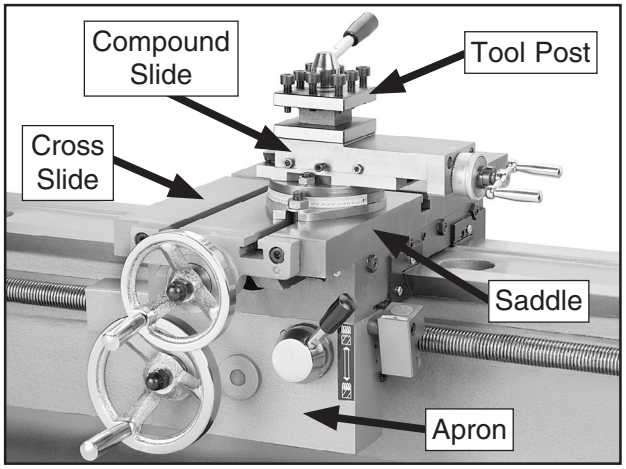


Figure 49. Carriage components.

Rotating the carriage handwheel moves the tooling left and right along the workpiece (or the X-axis).

Use the carriage or table lock on the rear of the table to provide additional rigidity and accuracy when facing (see **Figure 50**).

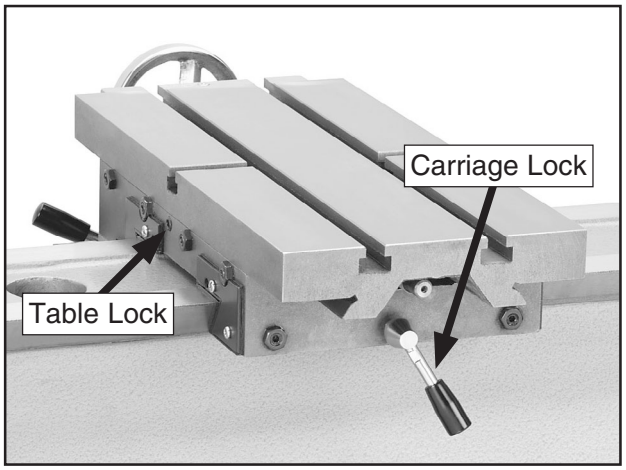


Figure 50. Carriage lock (viewed from the rear of the carriage).

Cross Slide (Table)

Handwheel Dial Increments	Resolution
Each Mark	0.002"
One Revolution	1"

The cross slide or table sits directly on the saddle of the carriage and moves perpendicular to the workpiece when the handwheel is rotated (Y-axis). The motion of this slide is used for facing a workpiece and when advancing a cut for reducing a diameter.

The handwheel dial is a *2:1* dial, which means the amount removed from the workpiece will be *twice* the actual distance the cross slide moves, but exactly what the graduated dial indicates.

Compound Slide

Handwheel Dial Increments	Resolution
Each Mark	0.002"
One Revolution	0.100"

The compound slide sits on the cross slide and is the base for the tool post. This slide is adjustable so that cuts may be produced at an angle. By loosening the bolts at the swivel base, as shown in **Figure 51**, the compound slide may pivot to any angle relative to the spindle center line.

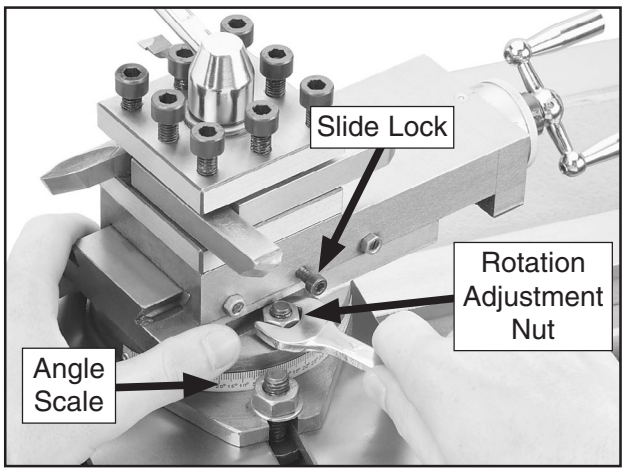


Figure 51. Changing the angle on the compound slide.

Tool Post

The Model G4791 lathe/mill is supplied with a 4-way turret tool post that sits on top of the compound slide and accepts up to four ½" tool bits (see **Figure 52**).

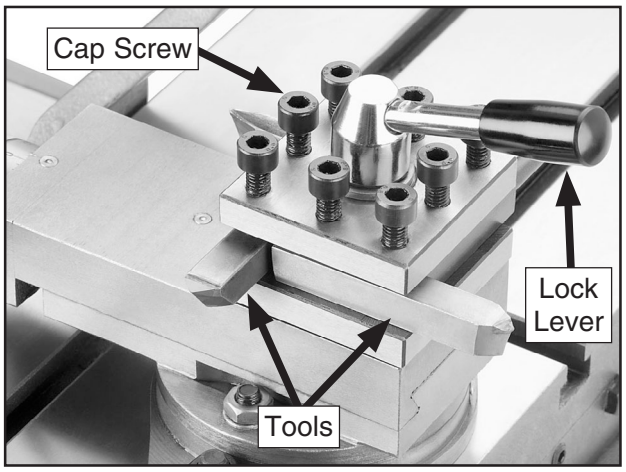


Figure 52. Tools mounted in the tool post.

A spring loaded catch is installed below the tool post and allows rotation in only one direction. The catch causes the tool post to stop at a defined position for each tool placement.

Tools Needed **Qty**
Hex Wrench 5mm..... 1

To load and use the 4-way tool post:

1. Loosen the tool post cap screws until the tool fits under them, then evenly tighten the cap screws to secure the tool.

2. Repeat **Step 1** for the remaining tools.

3. Loosen the lock lever, rotate the tool post to index the desired tool to the workpiece, then re-tighten the lock lever.

When securing a tool into the tool post, always remember these rules:

- Secure the tool with at least two of the cap screws on the tool post.

- Make sure the top of the tool bit is at the lathe spindle center line or just below. Use a center mounted in the tailstock as a reference (see **Figure 53**).

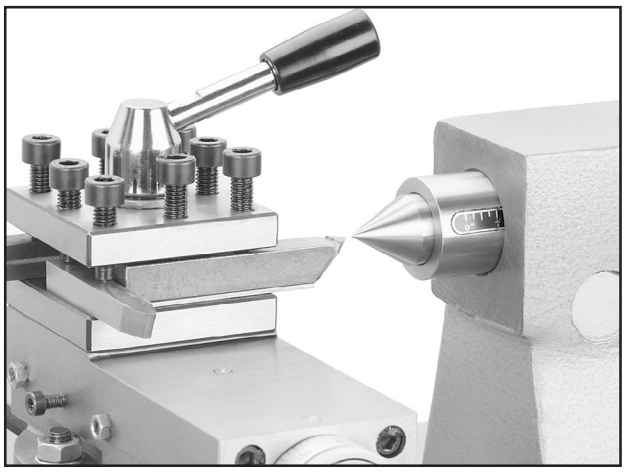


Figure 53. Using a center to check tool height.

- If necessary to shim the tool to bring it to the correct height, be sure to use steel shims as opposed to aluminum or brass shims. Soft metal shims may give, allowing the tool to become loose or chatter, contributing to a poor finish.

- Always use sharp tools.

- Never extend the tool more than 2½ times its thickness from the edge of the tool rest. For example, a ⅜" tool should only extend 15⁄16" past the bottom of the tool rest. Less is better!

Setting Lathe Speed

To set the correct lathe spindle speed for your operation, you will need to: 1) Determine the spindle speed (RPM) needed for your workpiece material, and 2) configure the lathe V-belts for the calculated spindle speed.

Calculating Correct Spindle Speed

1. Use the table in **Figure 54** to determine the recommend cutting speed for the workpiece material.

Note: *Cutting speeds are expressed in surface feet cut per minute (SFM).*

Recommended Cutting Speeds		
	Average Tool Speed (sfm)	
Work Material	*Rough Cuts*	*Finish Cuts*
Magnesium	400	800
Aluminum	350	700
Brass & Bronze	250	500
Copper	100	250
Cast Iron (Soft)	100	250
Cast Iron (Hard)	50	150
Mild Steel	100	250
Cast Steel	70	150
Alloy Steels (Hard)	50	150
Tool Steel	50	150
Stainless Steel	60	180
Titanium	90	200
Hi Maganese Steel	40	100
Note: *These values are based on HSS cutting tools. For carbide cutting tools, double the average speed. These values are a guideline only. Refer to the MACHINERY'S HANDBOOK for more detailed information.*		

Figure 54. Recommend cutting speed table.

2. Determine the final diameter, in inches, for the cut you intend to make.

Note: *For this step, you will need to average out the diameters or work with the finished diameter.*

3. Use the following formula to determine the correct spindle speed (RPM) for your operation:

$$\textbf{Spindle Speed} = \frac{\textbf{Cutting Speed (SFM) x 4}}{\textbf{Diameter of Cut}}$$

Example A
You will make a ½" diameter finish cut on a cast steel workpiece, using an HSS cutting tool.

Step 1:
150 (SFM from chart) x 4 = 600

Step 2:
600 / .5" (Diameter of cut) = 1200

Result:
The correct spindle speed is 1200 RPM.

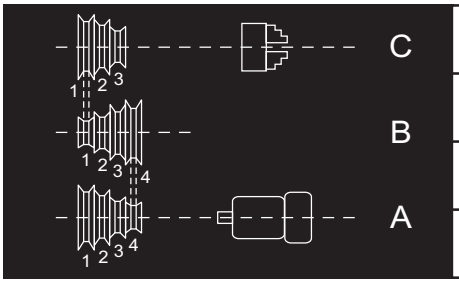
Example B
You will make a 1" diameter rough cut on a stainless steel workpiece, using a carbide cutting tool.

Step 1:
60 (SFM from chart) x 2 (for carbide tool) = 120

Step 2:
120 (Determined SFM) x 4 = 480

Step 3:
480 / 1" (Diameter of cut) = 480 RPM

Result:
The correct spindle speed is 480 RPM.



SPINDLE SPEED ✕ ↻/ min					
$\frac{A_4}{B_4} \times \frac{B_1}{C_1}$	250	$\frac{A_3}{B_3} \times \frac{B_1}{C_1}$	500	$\frac{A_2}{B_2} \times \frac{B_3}{C_3}$	1000
$\frac{A_4}{B_4} \times \frac{B_2}{C_2}$	315	$\frac{A_2}{B_2} \times \frac{B_1}{C_1}$	630	$\frac{A_1}{B_1} \times \frac{B_2}{C_2}$	1250
$\frac{A_4}{B_4} \times \frac{B_3}{C_3}$	400	$\frac{A_3}{B_3} \times \frac{B_2}{C_2}$	800	$\frac{A_1}{B_1} \times \frac{B_3}{C_3}$	1600

Figure 55. Lathe spindle speed chart.

Configuring Lathe V-Belts

There are nine lathe spindle speeds available by properly positioning the lathe V-belts between the motor, idler, and spindle pulleys. The idler pulley is mounted on a pivot arm and restrained by a spring that aids in V-belt tensioning.

To configure the lathe V-belts:

1. DISCONNECT MACHINE FROM POWER!

2. Open the change gear cabinet door and use **Figure 56** to identify the motor, idler, and spindle pulleys. Also note the pivot arm and tensioning spring.

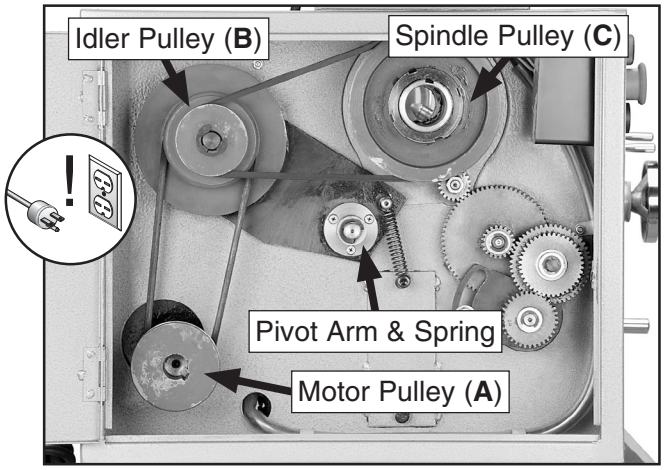


Figure 56. Lathe drive pulleys and V-belts.

3. Refer to the chart in **Figure 55** above and find the spindle speed that is closest to your calculated spindle speed.

   Note: *This chart is also on the front of the lathe head. In most cases, the calculated spindle speed will be between the available speeds. Use your best judgement when choosing either a higher or lower spindle speed.*

4. Configure the V-belts on the pulleys according to the letter and number combinations to the left of the selected spindle speed in the speed chart (see **Figure 55**).

   Note: *Your lathe/mill ships with three V-belts of varying length for the lathe spindle speed configuration: 1) 26", 2) 28", and 3) 29". Use your best judgement when deciding which length of V-belt to use for each pulley connection.*

   Tip: *When installing a V-belt, always position the V-belt on the larger pulley, then roll it onto the smaller pulley. Conversely, when removing a V-belt, roll it off the smaller pulley first.*

⚠WARNING

The V-belt, change gears, and pulleys represent a serious entanglement hazard when the lathe is running. Always have the change gear cabinet door closed and secure when the machine is connected to power.

Example

If you want to make a 1" diameter rough cut on an aluminum workpiece, using an HSS cutting tool, do the following:

Step 1: Examine the table in **Figure 54** to find the recommended cutting speed for the operation is 350 SFM.

Step 2: 350 SFM (from chart) x 4 = 1400

Step 3: 1400 / 1 (Diameter of cut) = 1400

Step 4: The lathe spindle speed chart (**Figure 55**) shows that 1250 RPM is the closest configurable spindle speed for the operation. The information in the box to the left of this spindle speed shows the required V-belt configuration.

Step 5: Position the spindle V-belt on the second spindle and idler pulley (B–C), then install the motor V-belt on the first motor and idler pulley, as shown in **Figure 57**.

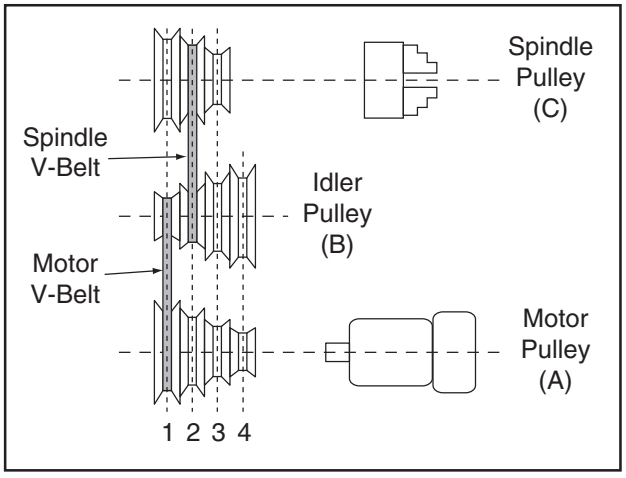


Figure 57. Lathe V-belts configured for a lathe spindle speed of 1250 RPM.

Setting Feed Rate

Feed rate is the speed the tool travels during the operation and is expressed in inches of carriage travel per revolution of the spindle (IPR), and is set by configuring the feed rate range lever and change gears.

Refer to the chart in **Figure 58** and the descriptions on the next page to understand how to use the chart to configure the feed rate for your operation.

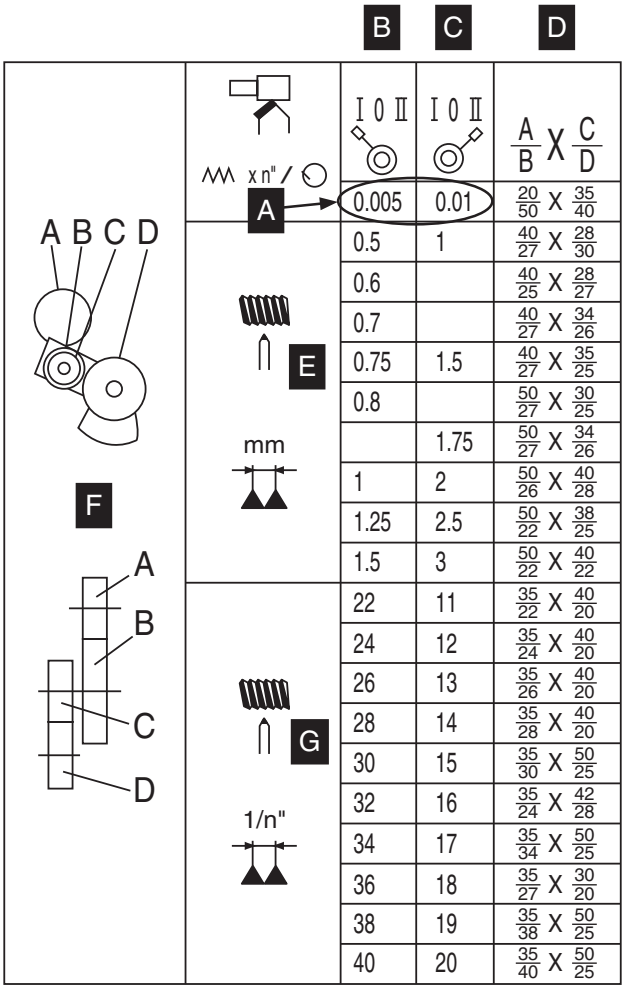


Figure 58. Feed rate configuration chart.

Note: *The feed rate configuration chart is also on the inside of the change gear cabinet door.*

A. The two feed rates—0.005 IPR and 0.010 IPR—are for powered carriage travel in non-threading operations.

B. Point the arrow of the feed rate range lever to the "**1/LO**" (low range) position when using feed rates or thread settings in this column (see **Figure 59**).

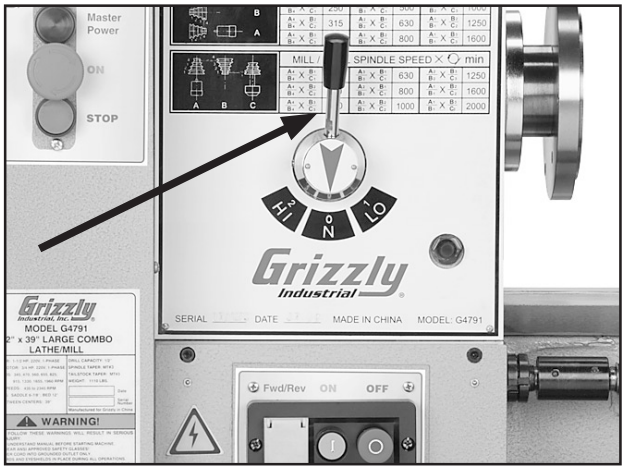


Figure 59. Feed rate range lever.

C. Point the arrow of the feed rate range lever to the "**2/HI**" (high range) position when using feed rates or thread settings in this column.

D. This column contains the change gear configurations for the selected feed rate or thread setting.

E. This section shows the change gear and range lever configuration for *metric* threads.

F. This section shows illustrations of the change gears and their relationships to one another.

G. This section shows the change gear and range lever configuration for *inch* threads.

Feed Rate Change Lever

The feed rate change lever shifts the feed rate between the high (**2/HI**) and low (**1/LO**) ranges, and will keep the leadscrew from rotating during operation when in the center neutral (**0/N**) position (see **Figure 59**).

Turn the lathe ***OFF*** and allow the spindle to come to a complete stop before shifting the range lever. If necessary to mesh the gears while shifting, rotate the spindle by hand with slight pressure on the lever.

Note: *The illustrations provided at the top of the **B** and **C** columns of the feed rate configuration chart show the handle of the range lever pointing to "**I**" or "**II**", which appears opposite of the actual configuration of the lever. If requiring the "**I**" position as directed in the chart, point the arrow on the lever hub to **1/LO** (low). Conversely, if the chart directs you to select the "**II**" position, point the arrow at **2/HI** (high).*

NOTICE

Attempting to move the feed rate range lever when the lathe is running will damage the internal gears of the power feed mechanism and will void the warranty. NEVER attempt to move the feed rate range lever when the lathe is running.

Configure Change Gears

Tools Needed	Qty
Wrench 10mm	1
Wrench 16mm	1

To configure the change gears:

1. DISCONNECT MACHINE FROM POWER!

2. Open the change gear cabinet door, and refer to **Figure 60** to identify the change gear components and their relationship to one another.

Note: *Your lathe/mill is shipped with the following change gears installed:*

Change Gear "**A**": 20T
Change Gear "**B**": 50T
Change Gear "**C**": 40T
Change Gear "**D**": 35T

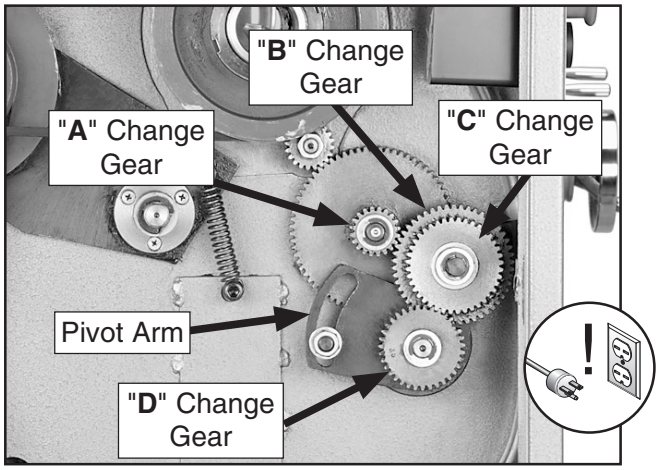


Figure 60. Lathe change gear components.

3. Examine the feed rate configuration chart (**Figure 58** on **Page 44**) to determine the change gear configuration for the selected feed rate or thread setting (**Column D**).

4. Arrange the change gears as required. Leave approximately 0.002"–0.003" (0.05–0.08mm) backlash between the gears.

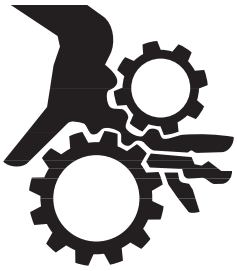
Note: *Before you install or store the gears, thoroughly clean all components with a stiff brush and mild solvent, dry them, then brush a thin film of ISO 68 oil or equivalent.*

Change Gear "A"

a. Loosen the hex nut securing the pivot arm and swing the "**B**" gear out of the way.

b. Remove the E-clip and flat washers securing the "**A**" gear, replace the gear with the correct one, then replace the washers and E-clip.

c. Position the "**B**" gear so that it properly meshes with the "**A**" gear, then re-tighten the pivot arm hex nut.



⚠WARNING

The V-belt, change gears, and pulleys represent a serious entanglement hazard when the lathe is running. Always have the change gear cabinet door closed and secure when the machine is connected to power.

Change Gear "B" or "C"

a. Loosen the pivot arm hex nut and swing the "**B**" gear away from the "**A**" gear.

b. Remove the bolt holding the "**B**" and "**C**" gears to the pivot arm, then remove the assembly.

Note: *Be sure to retain the T-nut behind the pivot arm that the bolt threads into.*

c. Disassemble the bolt, flat washers, and gears, then re-assemble the parts with the correct gears.

d. Secure the assembly with the bolt threaded into the T-nut, but do not fully tighten the bolt.

e. Position the pivot arm so that the "**B**" gear properly meshes with the "**A**" gear, and the "**C**" gear meshes with the "**D**" gear, then fully tighten the bolt with the T-nut and the pivot arm hex nut.

Change Gear "D"

a. Loosen the pivot arm hex nut and move the "**C**" gear out of the way.

b. Remove the E-clip and flat washers securing the "**D**" gear, replace the gear with the correct one, then replace the washers and E-clip.

c. Position the "**C**" gear so that it properly meshes with the "**D**" gear, then re-tighten the pivot arm hex nut.

5. Rotate the spindle by hand and make sure all change gears are properly meshed with adequate backlash.

—If the change gears are not properly meshed or rotating freely, repeat this procedure until they are.

6. Close and secure the change gear cabinet door before connecting the machine to power.

Example of Setting Feed Rate

If you want to cut a thread of 13 TPI (teeth per inch), do the following:

Step 1: Examine the feed rate configuration chart (**Figure 58** on **Page 44**) to find the required configuration for the range lever and change gears.

Step 2: With the spindle stopped, move the range lever to the **2/HI** (high) position.

Step 3: With the machine disconnected from power, install the following change gears:

—35T gear in the "**A**" position.
—26T gear in the "**B**" position.
—40T gear in the "**C**" position.
—20T gear in the "**D**" position.

Threading Controls

The purpose of this subsection is to orient you with the controls used when threading and how to use the thread dial on this machine.

Half-Nut Lever

The half-nut lever engages the carriage half-nut with the rotating leadscrew, which moves the mounted tool along the workpiece.

Move the half-nut lever down to engage the half-nut with the leadscrew, and conversely, move the lever up to disengage the half-nut from the leadscrew (see **Figure 61**).

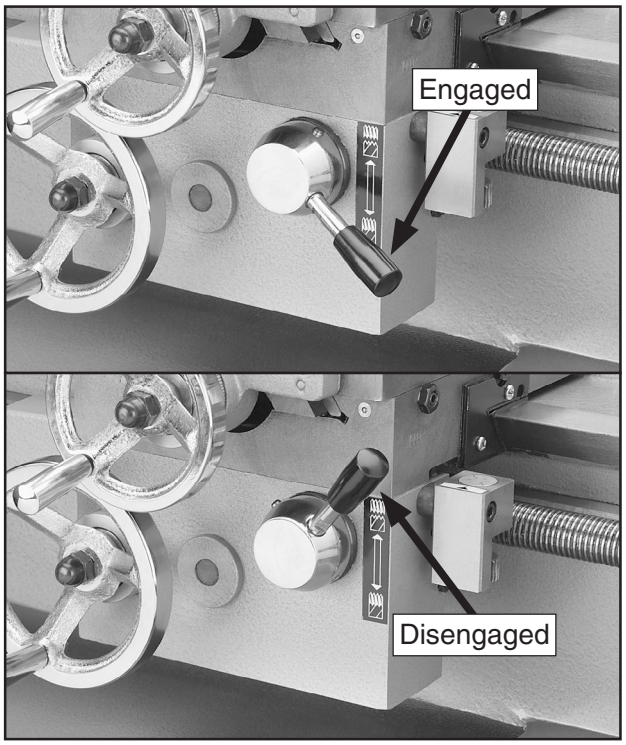


Figure 61. Half-nut lever in the engaged and disengaged positions.

Thread Dial

The numbers on the thread dial (see **Figure 62**) are used to show when to engage the half-nut during inch threading operations.

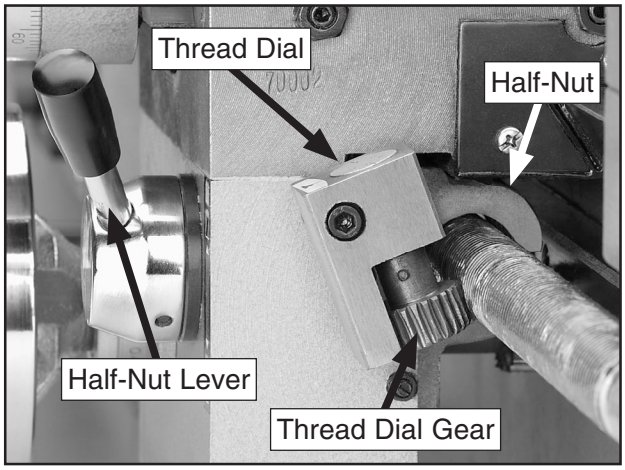


Figure 62. Thread dial and half-nut.

The thread dial must be engaged with the leadscrew to operate. To engage the thread dial, loosen the mounting cap screw, pivot the thread dial gear onto the leadscrew so the gear teeth mesh with the leadscrew, then re-tighten the cap screw.

NOTICE

Use lower spindle speeds (RPM) when threading. A slower RPM will give you more time to engage/disengage the half-nut, especially if threading over a short distance or threading up to a shoulder.

Follow these rules and refer to the chart in *Figure 63* when using the thread dial:

- If your selected thread pitch is any multiple of 8 (e.g., 8, 16, 32, etc.), engage the half-nut without referencing the thread dial.

  Note: *The thread pitch of the longitudinal leadscrew is 8.*

- For cutting an even or an odd, whole number thread pitch, engage the half-nut on any line of the thread dial (see **Figure 64**).

- When cutting half-threads (e.g., 4½), engage the half-nut on the 1 and 3, or the 2 and 4. Whichever combination you choose, stay with those numbers until the threads are complete.

- If you are cutting quarter-threads (e.g., 5¾), engage the half-nut on any number and use that number for each pass until the threads are complete.

Thread Pitch	Thread Dial Setting
Any multiple of 8	None required
Whole number—even or odd	On any line
Half threads (e.g., 4½)	1 and 3, or 2 and 4
Quarter threads (e.g., 5¾)	Any number and use the same number for all passes.

Figure 63. Thread dial chart.

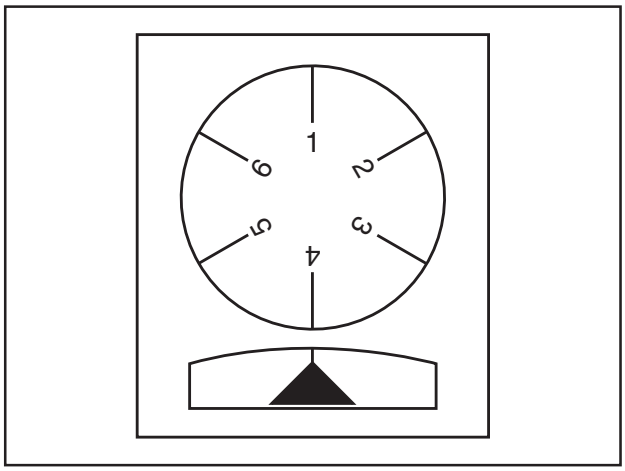


Figure 64. Illustration of thread dial.

Note: *The thread dial is not used when cutting metric threads. Once the half-nut is engaged, you must leave it engaged until the threads are complete.*

SECTION 6: ACCESSORIES

H8257—Primrose Armor Plate with Moly-D Machine and Way Oil 1 Quart
This superior machine and way lubricant prevents stick slip and chatter due to anti-friction capabilities resulting in greater precision machining capabilities. Provides the thinnest oil film possible while effectively providing needed lubrication and rust/corrosion protection. Adhesive/cohesive components are added for vertical surfaces. Resists squeeze out, running, dripping and non-gumming.

Figure 65. Primrose Armor Plate Lubricant.

G9849—Magnetic Base/Dial Indicator Combo
Precision measurements and setups have never been so easy. Magnetic base engages with just the turn of a switch and allows pinpoint adjustment. The dial indicator features 0–1" travel and has a resolution of 0.001". This fine set includes a molded case for protection and convenience.

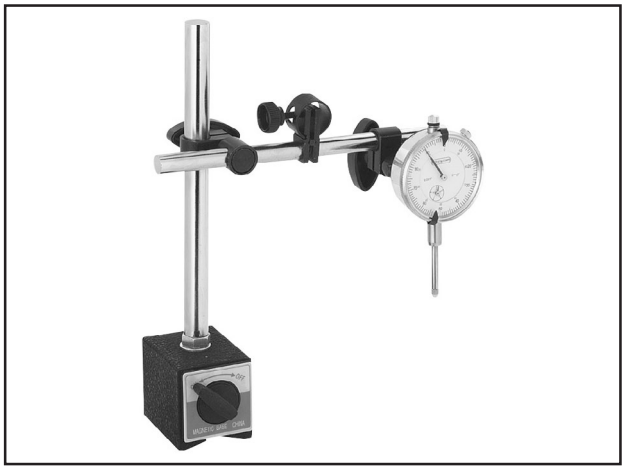


Figure 66. G9849 Magnetic Base/Dial Indicator Combo.

G1076—52-PC. Clamping Kit, ½" T-Nut
Our clamping kits are among the best in the world! All the blocks, bolts, nuts, and hold-downs are case hardened. This clamping kit includes: 24 studs, 6 step block paris, 6 T-nuts, 5 flange nuts, 4 coupling nuts, and 6 end hold-downs. The rack can be bolted to the wall or side of the machine for easy access.

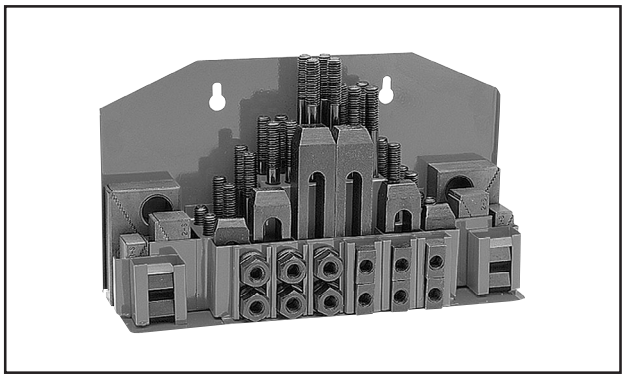


Figure 67. G1076 52-PC. Clamping Kit.

G1070—MT3 Live Center Set
A super blend of quality and convenience, this live center set offers seven interchangeable tips. High-quality needle bearings prolong tool life and special tool steel body and tips are precision ground. Supplied in wooden box.

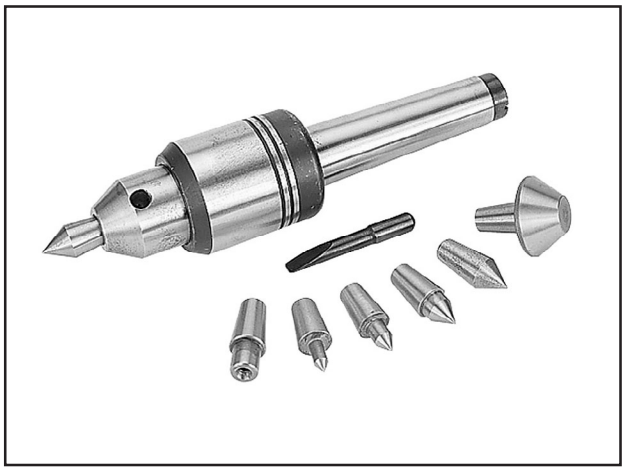


Figure 68. G1070 Live Center Set.

Call 1-800-523-4777 To Order

T10063—Milling Vise 12⅝" x 6⅜"
T10064—Milling Vise 17⅛" x 8¾"

- Ultra precise in flatness, parallelism and verticality.
- Anti-lift mechanism ensures the workpiece does not lift when jaws are tightened.
- Ductile iron body.
- Flame hardened vise bed and jaws.
- Sealed bearing system.
- 8200 lbs. of clamping pressure.

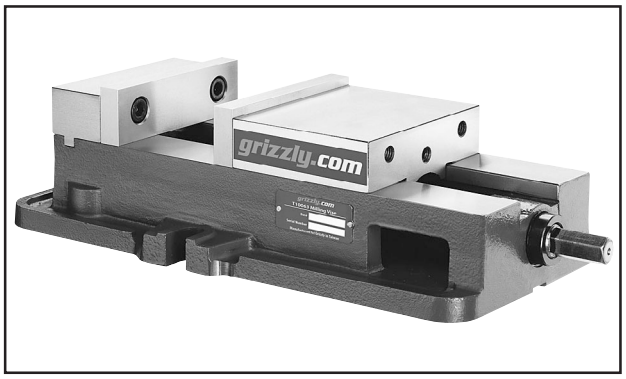


Figure 69. T10064 Milling vise (handle included, but not shown.

H2987—½" Bent Lathe Dog
Just the thing for precision machining between centers! These bent tail Lathe Dogs are made of durable cast iron and feature square head bolts.

Figure 70. H2987-91 Lathe Dogs.

Call 1-800-523-4777 To Order

H7540—Metalworking Kit No. 1
Get started with the practical lathe kit that includes the following hand essentials:

- Double-ended boring bar with holder and two ¼" HSS tool bits
- Two round head fly cutters
- Six-head knurling tool
- Double-ended knurling tool
- Straight turning tool holder with 5⁄16" HSS tool bit
- Cut-off tool holder with three HSS blades
- Hex wrenches
- Protective wooden case

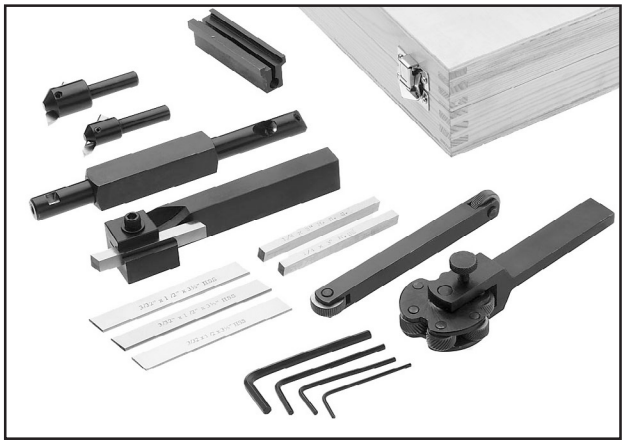


Figure 71. Model H7540 Metalworking Kit No. 1.

G9256—6" Dial Caliper
G9257—8" Dial Caliper
G9258—12" Dial Caliper
These traditional dial calipers are accurate to 0.001" and can measure outside surfaces, inside surfaces, and heights/depths. Features stainless steel, shock resistant construction and a dust proof display. An absolute treat for the perfectionist!

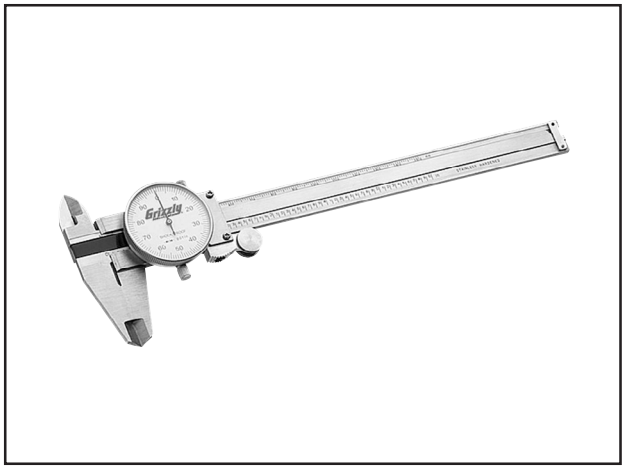


Figure 72. Grizzly® Dial Calipers.

H6879—Lathe Operation & Maintenance Book
H6880—Turret Mill Operation
G5053—The Home Machinist's Handbook
These detailed book provide extensive coverage of a wide variety of metalworking operations. Special emphasis is placed on components, accessories, and operating procedures, including basic machine setup and routine maintenance. A "must have" references for all metal workers.

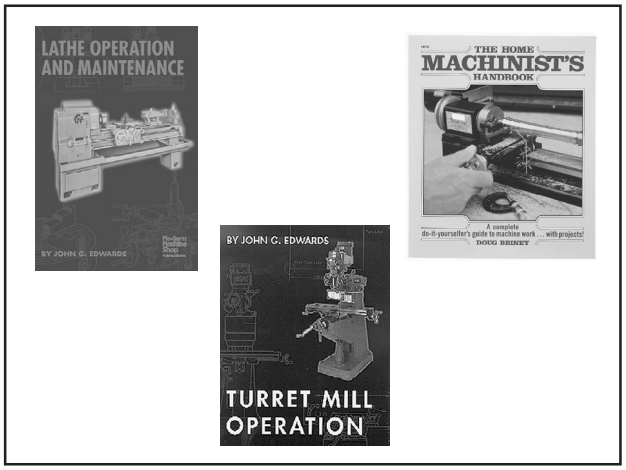


Figure 73. Metalworking books.

H2670—HSS Square Tool Bits, ½" x ½" x 4"
Our ground tool bits are M-2 HSS, making them some of the most durable tool bits around. Make your own specialized cutters in any shape using a silicon carbide grinding wheel (G8235-37) on your grinder.

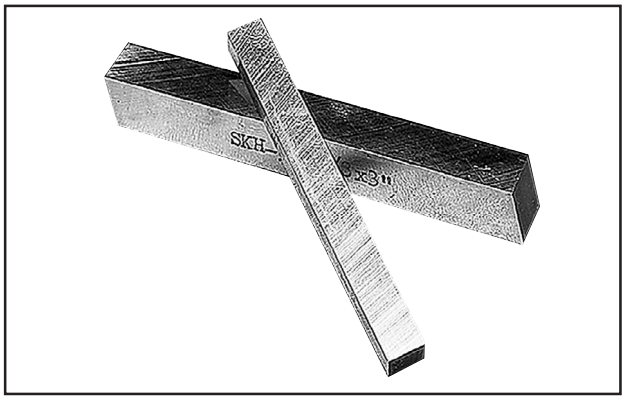


Figure 74. H2670 HSS Square Tool Bits.

Call 1-800-523-4777 To Order

H2677—6" Precision Rotary Table
Need a horizontal rotary table for your lathe/mill? This is the one for you! It features 4 T-slots for ⅜" studs, 4° per rotation the handwheel, 10 minute vernier resolution, whole degree marks on the table, coolant trough, and the worm gear can be easily disengaged for quick angle setting.

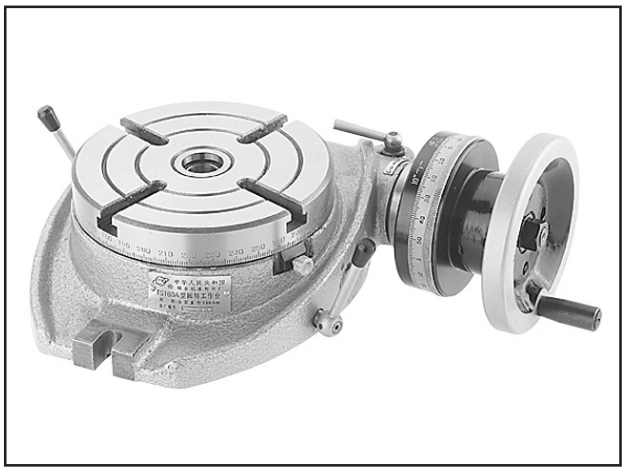
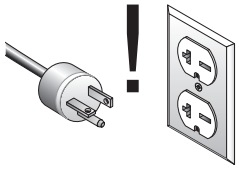


Figure 75. H2677 6" Precision Rotary Table.

H5680—Glanze 7-Pc. Insert Turning Tool Set
H5682—10-Pack of Carbide Inserts
Here's a precision set for precision turning. These ½" tools have been machined to exacting specifications and feature rugged tool steel bodies with black oxide finish. They all use the same diamond inserts and what's more, all 4 corners of the inserts are indexible! Supplied in a fitted case.

Figure 76. H5680 Glanze 7-Pc. Insert Turning Tool Set.

SECTION 7: MAINTENANCE



⚠WARNING

Always disconnect power to the machine before performing maintenance. Failure to do this may result in serious personal injury.

Schedule

For optimum performance from your machine, follow this maintenance schedule and refer to any specific instructions given in this section.

Daily Check:
- Loose mounting bolts.
- Damaged or worn belts.
- Worn or damaged wires.
- Any other unsafe condition.

Every 6–8 Hours of Operation:
- Clean the machine.
- Daily lubrication procedures (**Page 54**).
- Check lathe gearbox oil (**Page 56**).

After First Three Months:
- Change lathe gearbox oil (**Page 59**).

Semi-Annually:
- Semi-Annual lubrication procedures (**Page 57**).

Annually:
- Change lathe gearbox oil (**Page 56**).

Cleaning & Protecting

- Disconnect the lathe from power before cleaning.
- Vacuum excess metal chips as they accumulate and wipe off built-up grime.

⚠CAUTION

DO NOT use compressed air to blow away chips from the lathe to avoid the risk of flying metal debris injuring yourself or others, or driving the chips deep into the lathe mechanisms resulting in damage or premature wear.

- Use a dry cloth to wipe off any remaining coolant at the end of the day. Metal chips soaked with water-based coolant left on the machine will invite oxidation and gummy residue to build up around moving parts.
- Follow Federal, State, and the manufacturer's requirements to properly dispose of used coolant and cleaning products.
- Protect the unpainted metal surfaces on the lathe by wiping them clean at the end of operations. Keep these surfaces, especially the bedways, rust-free and working smoothly with regular applications of products such as Model H8257 Primrose Armor Plate with Moly-D Machine and Way Oil (see **ACCESSORIES** on **Page 50**).

Lubrication

Your lathe has numerous moving metal-to-metal contacts that require proper lubrication to help ensure efficient and long-lasting operation.

Other than the lubrication points covered in this section, all other bearings are internally lubricated and sealed at the factory. Simply leave them alone unless they need to be replaced.

Before adding lubricant, clean away any debris and grime from the lubrication point to avoid contaminating the lubricant and increasing wear of the moving parts.

DISCONNECT THE LATHE FROM POWER BEFORE PERFORMING LUBRICATION!

Daily Lubrication Procedures

Use the chart in **Figure 77** and photographs in **Figures 78–90** on the following pages to perform the daily lubrication procedures.

For ball oilers, wipe them clean, then depress the ball with the tip of an oil can and squirt once. For other components, thoroughly clean them, then use a clean rag or paint brush to apply a thin coat of lubricant.

Description	Figure	Lubricant	Method	Amount
Leadscrew Drive Shaft	**78**	ISO 68 Oil or Equivalent	2 Ball Oilers	1 Squirt
Change Gear "**A**" Shaft	**79**	ISO 68 Oil or Equivalent	1 Ball Oiler	1 Squirt
Change Gear Teeth	**79**	ISO 68 Oil or Equivalent	Brush On	Thin Coat
Mill Column & Leadscrew	**80**	Way Oil	Wipe On/Brush On	Thin Coat
Mill Quill	**81**	Way Oil	Wipe On Full Length	Thin Coat
Downfeed Gears	**82**	ISO 68 Oil or Equivalent	1 Ball Oiler	1 Squirt
Table Ways	**83**	ISO 68 Oil or Equivalent	2 Ball Oilers	1 Squirt
Table Leadscrew	**84**	ISO 68 Oil or Equivalent	1 Ball Oiler	1 Squirt
Compound Slide	**85**	ISO 68 Oil or Equivalent	2 Ball Oilers	1 Squirt
Bedways	**86**	Way Oil	Wipe On Full Length	Thin Coat
Longitudinal Leadscrew & Rack	**87**	Way Oil	Brush On Full Length	Thin Coat
Tailstock	**88**	ISO 68 Oil or Equivalent	2 Ball Oilers	1 Squirt
Leadscrew End Cap	**89**	ISO 68 Oil or Equivalent	1 Ball Oiler	1 Squirt
Lathe Lower Spindle Bearing	**90**	ISO 68 Oil or Equivalent	Through Drift Key Hole Between Quill & Spindle	1 Squirt

Figure 77. Daily lubrication chart.

NOTICE

Follow reasonable lubrication practices as outlined in this manual for your lathe. Failure to do so could lead to premature failure of your lathe and will void the warranty.

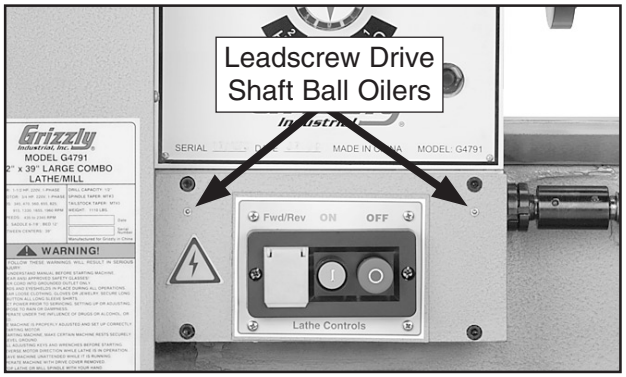


Figure 78. Leadscrew drive shaft ball oilers.

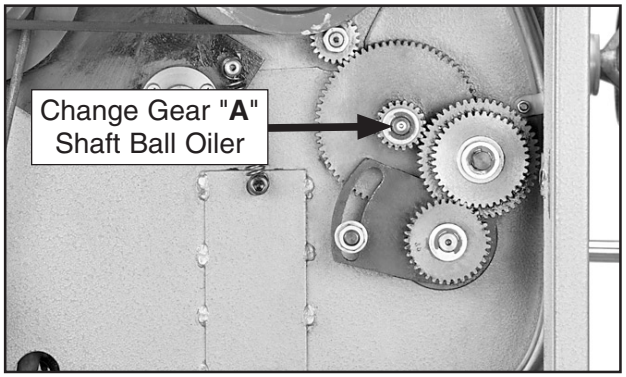


Figure 79. Change gear "**A**" shaft ball oiler and change gears.

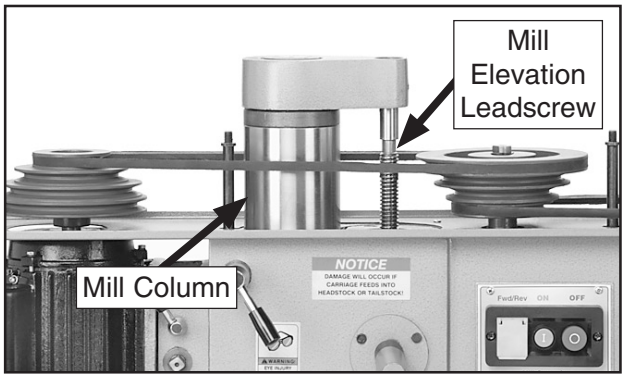


Figure 80. Mill column and leadscrew.

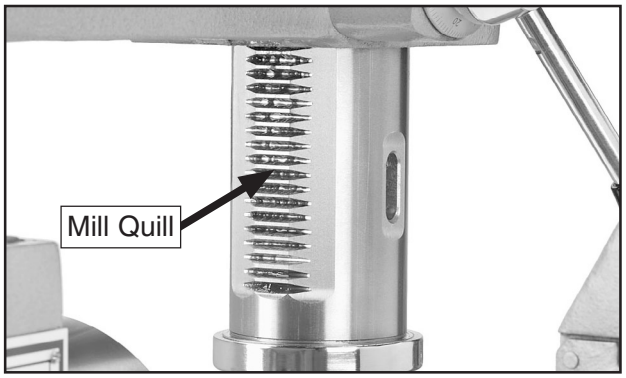


Figure 81. Mill quill.

Figure 82. Downfeed ball oiler.

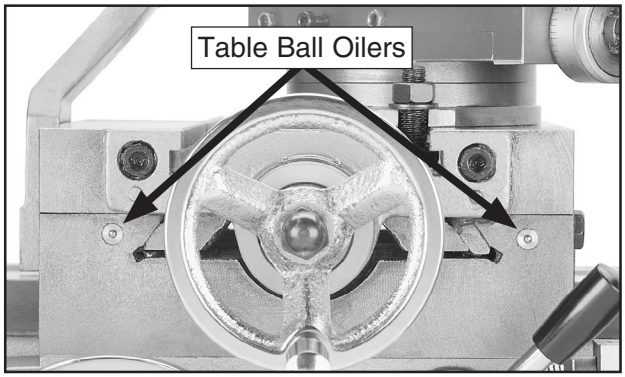


Figure 83. Table ball oilers.

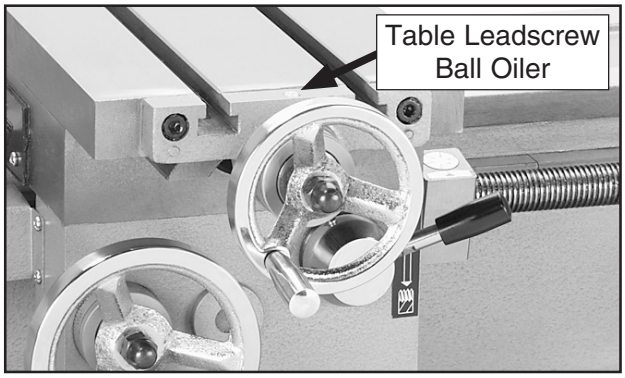


Figure 84. Table leadscrew ball oiler.

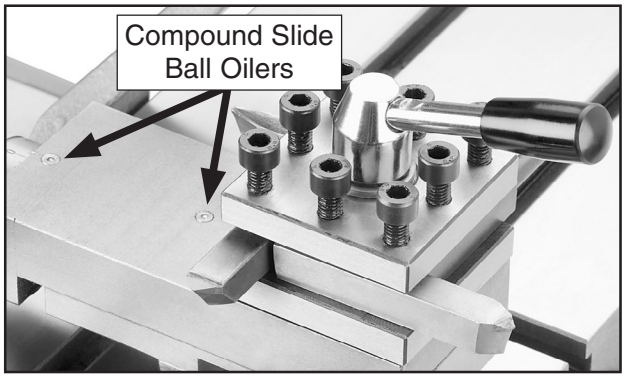


Figure 85. Compound slide ball oilers.

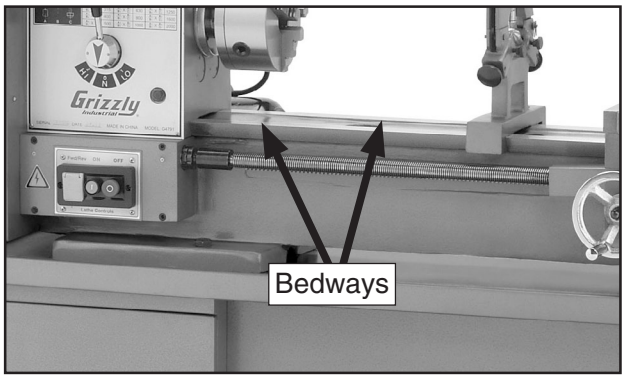


Figure 86. Bedways.

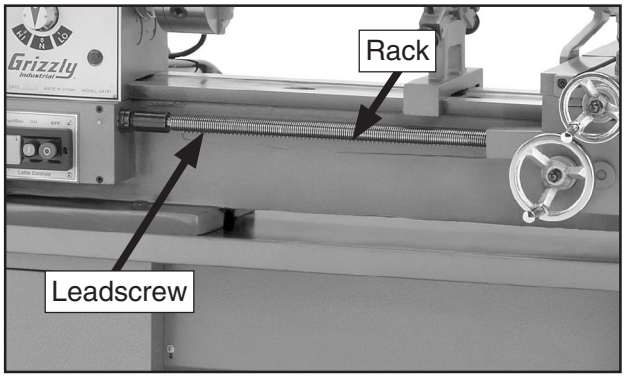


Figure 87. Leadscrew and rack.

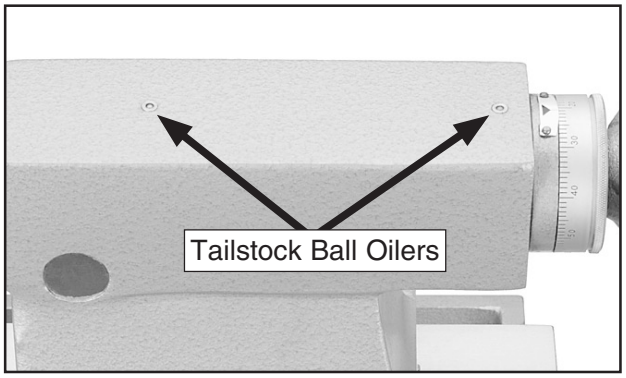


Figure 88. Tailstock ball oilers.

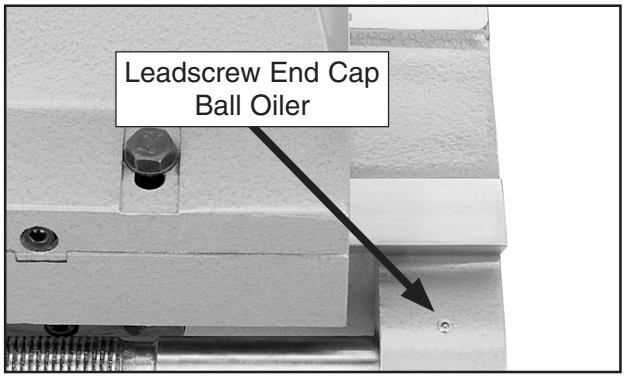


Figure 89. Leadscrew end cap ball oiler.

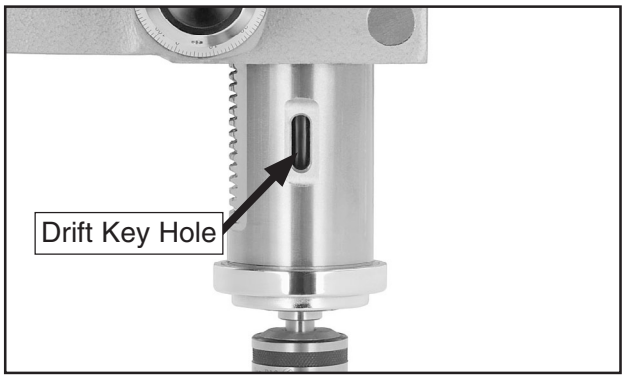


Figure 90. Lower mill spindle bearing through drift key hole.

Checking/Adding Lathe Gearbox Oil Reservoir

Lubricant	Frequency	Qty
ISO 68 or Equivalent Lubricant	Check/ Fill Every 8 Hours of Operation	Half-Way Mark in Sight Glass

The lathe gearbox oil reservoir must be checked and oil added, if necessary, on a daily basis.

Tools Needed **Qty**
Large Standard Screwdriver..... 1

To check and add oil to the reservoir:

1. Check the oil reservoir sight glass shown in **Figure 91**. If the oil level is below the half-way mark, continue with the following steps to add oil.

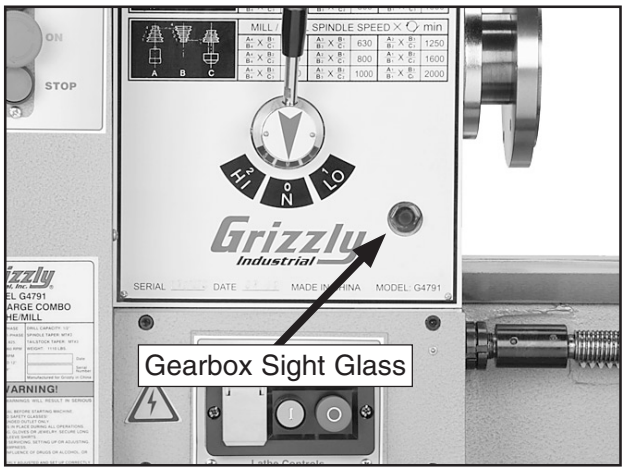


Figure 91. Gearbox sight glass.

2. Wipe clean the area around the fill plug to prevent debris from falling into the reservoir when adding oil (see **Figure 92**).

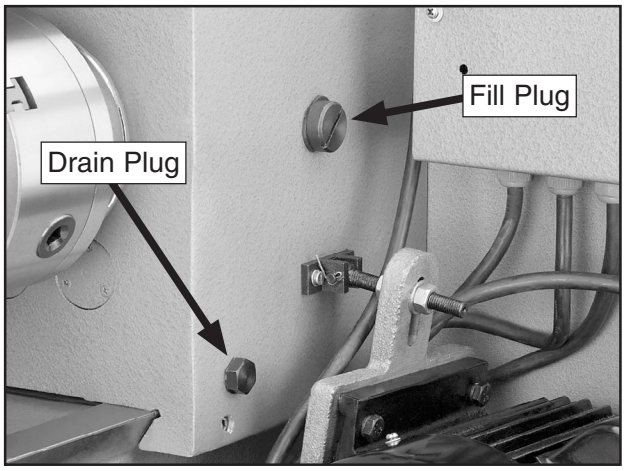


Figure 92. Gearbox fill and drain plugs, as seen from the rear of the lathe head.

3. Remove the fill plug.

4. Slowly add oil until the level is centered in the sight glass.

5. Replace the fill plug.

NOTICE

The lathe gearbox oil must be changed after the first three months of operation, then annually after that.

Semi-Annual Lubrication

This lathe/mill has four areas that require at least semi-annual lubrication: 1) The mill elevation bevel gears, 2) the mill column thrust bearing, 3) the mill motor mount rack, and 4) the upper mill spindle bearing. Use your best judgement to determine if more frequent lubrication of these areas are needed depending upon your usage.

Tools Needed	**Qty**
Wrench 10mm	1
Standard Screwdriver	1

To perform the semi-annual procedure:

1. DISCONNECT MACHINE FROM POWER!

2. Remove the three hex bolts securing the elevation bevel gear end cap shown in **Figure 93**.

Figure 93. Mill elevation bevel gear end cap.

3. Remove the end cap with the attached bevel gear.

   Note: *If necessary to pry the end cap off, make sure to pry evenly around the outside of the end cap to avoid damage to the bevel gear teeth.*

4. Clean away built-up grime and debris from the bevel gears and the internal cavity, then brush on a coat of NLGI #2 grease to the teeth of the bevel gears (see **Figures 94–95**).

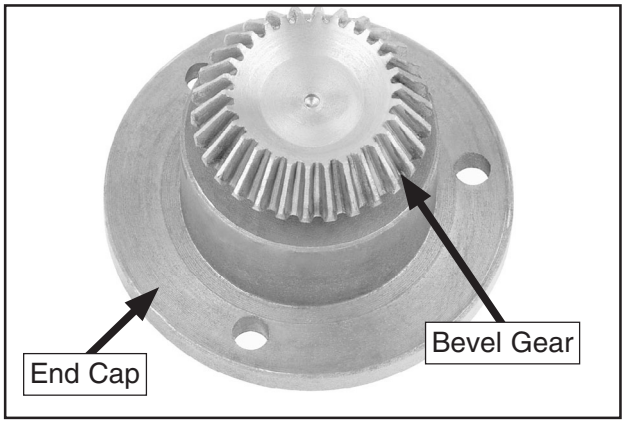


Figure 94. Mill elevation crank bevel gear.

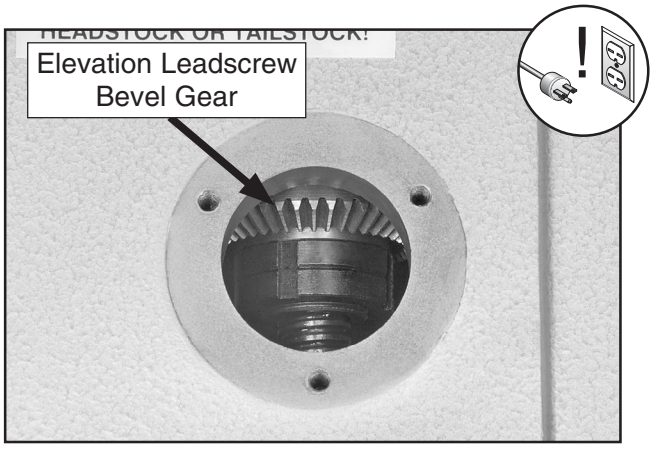


Figure 95. Mill elevation leadscrew bevel gear.

5. Re-install the end cap, then move the mill head up and down on the column to distribute the grease.

   Note: *To avoid damage to the bevel gears, make sure the teeth of the bevel gears mesh while inserting the end cap and gear without forcing them into the head.*

6. Remove the mill drive system cover.

7. Mark the retaining collar and the column so that you can return the retaining ring to the same position when finished with this procedure (see **Figure 96**).

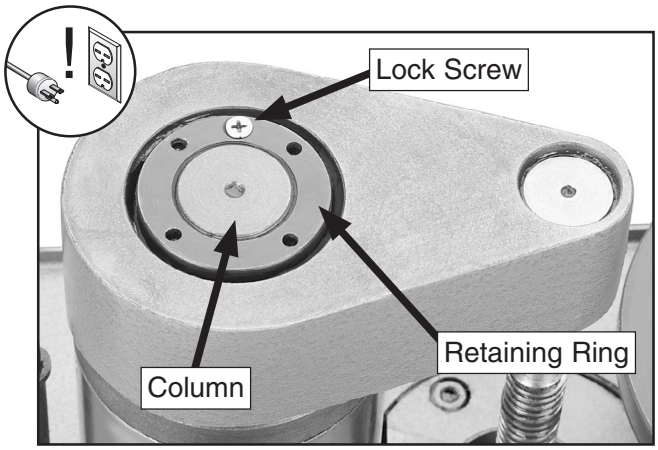


Figure 96. Mill column thrust bearing retaining collar.

8. Loosen the lock screw, then remove the retaining ring.

9. Clean away any debris and built-up grime from around the thrust bearing shown in **Figure 97**, then add NLGI #2 grease to the top and sides of the bearing.

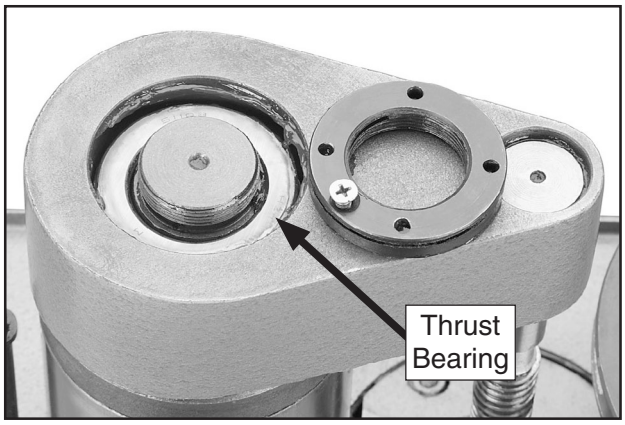


Figure 97. Mill column thrust bearing with retaining ring removed.

10. Re-install the retaining ring, bringing it back to the original position that you marked in **Step 7**, then secure it in place by re-tightening the lock screw.

11. Clean away any grease from the area, then remove the V-belts.

12. Loosen the mill motor lock, then use the hand crank to extend the mill motor all the way to the left, as shown in **Figure 98**.

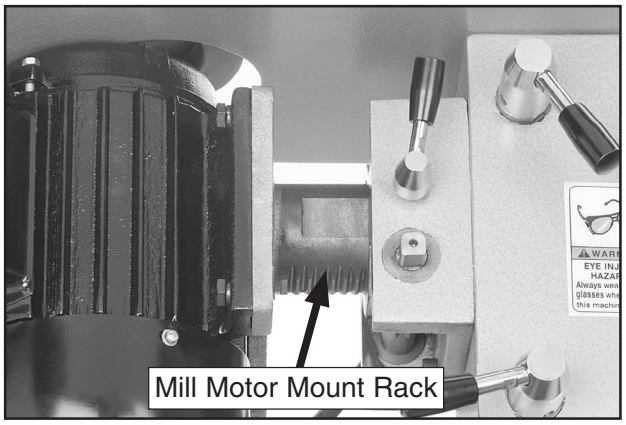


Figure 98. Mill motor mount rack.

13. Clean away any debris or built-up grime from the motor mount shaft and rack, then brush on a coat of NLGI #2 grease to the rack.

14. Remove the three screws securing the spindle pulley end cap, then lift the end cap off the spindle (see **Figure 99**).

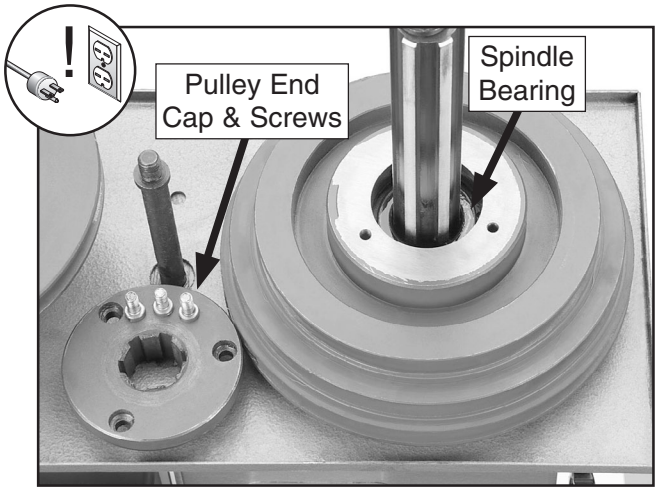


Figure 99. Upper mill spindle bearing exposed.

15. Clean away any debris and built-up grime from around the bearing, then add NLGI #2 grease to the top and sides of the bearing.

16. Re-install the end cap and clean away any grease from the area.

17. Re-install the V-belts and the mill drive system cover.

Changing Lathe Gearbox Oil

Lubricant	Frequency	Qty
ISO 68 or Equivalent Lubricant	Check/ Fill Every 8 Hours of Operation	Half-Way Mark in Sight Glass

Tools Needed	Qty
Large Standard Screwdriver	1
Wrench 19mm	1
Drain Pan (at least 1 Gallon Capacity)	1

To change the oil in the reservoir:

1. DISCONNECT LATHE FROM POWER!

2. Remove the reservoir fill plug (see **Figure 92** on **Page 56**).

Note: *If you have difficulty removing the fill plug, do not remove the drain plug to drain the reservoir until you can successfully remove the fill plug. This way you can still operate the lathe until the difficulty is resolved.*

3. Hold the drain pan under the reservoir drain plug, then remove the drain plug shown in **Figure 92**, and allow the oil to completely drain into the pan.

4. While holding the pan under the drain hole, pour approximately ½ quart of clean oil into the reservoir to flush out any sediment from along the bottom.

5. Re-install the drain plug and add oil to the reservoir until the oil level is centered in the sight glass.

6. Re-install the fill plug.

Lathe V-Belt Tensioning

The lathe V-belt pivot arm balances the tension between the motor V-belt and the spindle V-belt. However, the position of the lathe motor can be changed to further adjust this tensioning.

Tools Needed **Qty**
Wrench 17mm..... 1

To adjust the motor V-belt tension:

1. DISCONNECT MACHINE FROM POWER!

2. Loosen/adjust the hex nuts on the motor adjustment bolt shown in **Figure 100** to tilt the motor toward or away from the lathe head.

   Note: *Moving the motor toward the lathe head will reduce V-belt tension. Conversely, pulling the motor away from the lathe head will increase V-belt tension.*

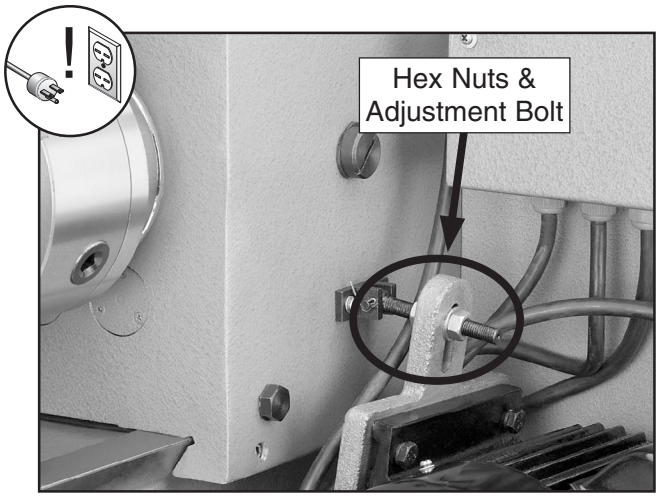


Figure 100. Motor adjustment hex nuts and bolt.

3. Open the change gear cabinet and check the V-belt tension. When moderate pressure is applied to the V-belts between the pulleys, there should be approximately ½" of belt deflection (see **Figure 101**).

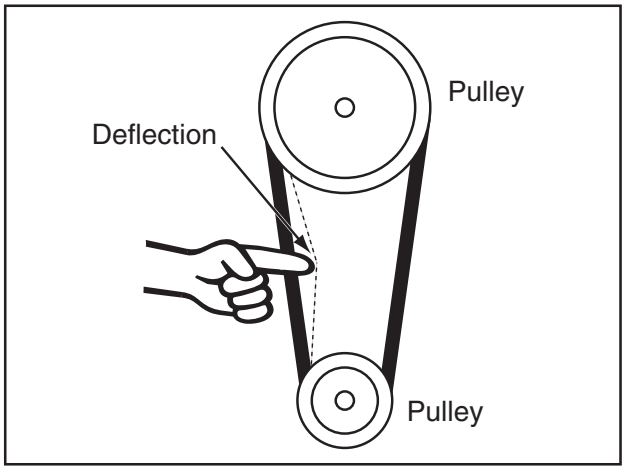


Figure 101. Checking for correct V-belt deflection.

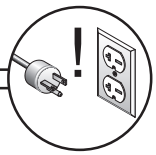
4. When you are satisfied with the tension of the V-belts, tighten the motor adjustment hex nuts to secure the motor in this position.

5. Close the change gear cabinet.

SECTION 8: SERVICE

Review the troubleshooting and procedures in this section to fix or adjust your machine if a problem develops. If you need replacement parts or you are unsure of your repair skills, then feel free to call our Technical Support at (570) 546-9663.

Troubleshooting



Motor & Electrical

Symptom	Possible Cause	Possible Solution
Machine does not start or a breaker trips.	1. Emergency stop button is pushed in or is at fault. 2. Plug/receptacle is at fault or wired incorrectly. 3. Power supply is switched OFF or is at fault. 4. Start capacitor is at fault. 5. Motor connection wired incorrectly. 6. ON button is at fault. 7. Motor windings or motor is at fault.	1. Turn the emergency stop button clockwise until it pops out; replace if faulty. 2. Test for good contacts; correct the wiring. 3. Ensure hot lines have correct voltage on all legs and main power supply is switched ***ON***. 4. Test; replace if faulty. 5. Correct motor wiring connections (**Page 73**). 6. Replace faulty ON button. 7. Replace motor.
Machine stalls or is overloaded.	1. Machine is undersized for the task. 2. Workpiece alignment is poor. 3. Dull or incorrect cutting tool. 4. Gearbox is at fault. 5. Motor connection is wired incorrectly. 6. Plug/receptacle is at fault. 7. Pulley/sprocket slipping on shaft. 8. Motor bearings are at fault. 9. Motor has overheated. 10. Motor is at fault.	1. Use smaller sharp tooling; reduce the feed rate; reduce the spindle RPM; use coolant. 2. Eliminate workpiece binding; properly secure workpiece. 3. Use sharp and correct cutting tool for the operation. 4. Select appropriate spindle speed range; replace broken or slipping gears. 5. Correct motor wiring connections. 6. Test for good contacts; correct the wiring. 7. Replace loose pulley/shaft. 8. Test by rotating shaft; rotational grinding/loose shaft requires bearing replacement. 9. Clean off motor, let cool, and reduce workload. 10. Test and repair or replace.
Machine has vibration or noisy operation.	1. Cutter is at fault. 2. Workpiece alignment is poor. 3. Motor or component is loose. 4. Pulley is loose. 5. Machine is incorrectly mounted or sits unevenly. 6. Motor fan is rubbing on fan cover. 7. Motor bearings are at fault. 8. Gearbox is at fault.	1. Replace/resharpen cutter; use appropriate feed rate and cutting RPM. 2. Eliminate workpiece binding; use vise or clamps as required for workpiece alignment control. 3. Inspect/replace stripped or damaged bolts/nuts, and re-tighten with thread locking fluid. 4. Realign/replace shaft, pulley, setscrew, and key as required. 5. Tighten/replace mounting bolts in floor; relocate/shim machine. 6. Replace dented fan cover or fan. 7. Test by rotating shaft; rotational grinding/loose shaft requires bearing replacement. 8. Rebuild gearbox for bad gear(s)/bearing(s).

Mill Operation

Symptom	Possible Cause	Possible Solution
Tool slips in collet.	1. Collet is not fully drawn into spindle taper. 2. Wrong size collet. 3. Debris on collet or spindle mating surface. 4. Excessive depth of cut.	1. Snug up drawbar. 2. Use correct collet for shank diameter. 3. Remove oil and debris from collet and spindle mating surfaces, then re-install. 4. Decrease depth of cut and allow chips to clear.
Tooling breaks.	1. Spindle speed/feed rate too fast. 2. Tooling getting too hot. 3. Excessive depth of cut.	1. Use correct spindle RPM and feed rate (**Page 23**). 2. Use coolant; reduce spindle RPM/feed rate. 3. Decrease depth of cut and allow chips to clear.
Machine is loud when cutting; overheats or bogs down in the cut.	1. Excessive depth of cut. 2. Dull tooling. 3. Feed rate too fast.	1. Decrease depth of cut and allow chips to clear. 2. Use sharp tooling. 3. Decrease feed rate.
Workpiece vibrates or chatters during operation.	1. Locks not tight. 2. Workpiece not securely clamped to table or mill vise. 3. Tooling not secure or is damaged. 4. Spindle speed/feed rate too fast. 5. Gibs are too loose.	1. Tighten all locks on mill that are not associated with movement for the operation. 2. Check that clamping is tight and sufficient for the operation; make sure mill vise is tight to table. 3. Secure tooling; replace if damaged. 4. Use correct spindle RPM and feed rate (**Page 23**). 5. Adjust gibs properly (**Page 64**).
Table hard to move.	1. Locks are tightened down. 2. Chips have loaded up on the ways. 3. Ways are dry and in need of lubrication. 4. Gibs are too tight.	1. Fully loosen locks needed for movement. 2. Frequently clean away chips that load up during operations. 3. Lubricate ways (**Page 54**). 4. Adjust gibs properly (**Page 64**).
Bad surface finish.	1. Wrong spindle speed/feed rate. 2. Dull/damaged tooling; wrong tooling for operation. 3. Wrong spindle rotation for tooling. 4. Workpiece not securely clamped to table or mill vise. 5. Gibs are too loose.	1. Use correct spindle RPM and feed rate (**Page 23**). 2. Sharpen/replace tooling; use correct tooling for operation. 3. Check for proper spindle rotation for tooling. 4. Check that clamping is tight and sufficient for the operation; make sure mill vise is tight to table. 5. Adjust gibs properly (**Page 64**).

Lathe Operations

Symptom	Possible Cause	Possible Solution
Bad surface finish.	1. Incorrect spindle speed or feed rate. 2. Dull tool or poor tool selection. 3. Too much play in gibs. 4. Tool too high.	1. Adjust for proper spindle speed and feed rate (**Page 42**). 2. Use sharp tools; use correct tool for the operation. 3. Adjust gibs (**Page 64**). 4. Lower tool position (**Page 41**).
Cannot remove tapered tool from tailstock quill.	1. Quill not retracted all the way back into the tailstock. 2. Debris/oil not removed from tapered mating surfaces before inserting into quill.	1. Rotate the quill handwheel until the tapered tool is forced out of quill. 2. Always make sure that tapered mating surfaces are clean before inserting.
Gear(s) will not line up and mesh.	1. Gear(s) not aligned in headstock.	1. Rotate spindle by hand until gear(s) falls into place.
Cutting tool or machine components vibrate excessively during cutting.	1. Tool holder not tight enough. 2. Cutting tool too far out from holder; lack of support. 3. Too much play in gibs. 4. Cutting tool is dull. 5. Incorrect spindle speed or feed rate.	1. Check for debris, clean, and re-tighten. 2. Re-install cutting tool with no more than ⅓ of total length is sticking out of tool holder. 3. Adjust gibs (**Page 64**). 4. Sharpen/replace. 5. Adjust for proper spindle speed and feed rate (**Page 42**).
Cross/compound slide or carriage feed has sloppy operation.	1. Too much play in gibs. 2. Handwheel(s) loose. 3. Too much leadscrew backlash (cross slide only). 4. Leadscrew mechanism worn or out of adjustment.	1. Adjust gibs (**Page 64**). 2. Tighten handwheel fasteners. 3. Adjust leadscrew backlash (**Page 65**). 4. Tighten any loose fasteners on leadscrew mechanisms; check for excessive wear/replace if necessary.
Cross/compound slide or carriage feed hard to move.	1. Gibs are loaded up with chips/grime. 2. Gibs are too tight. 3. Leadscrew backlash setting too tight (cross slide only). 4. Bedways are dirty/dry. 5. Gearing is at fault.	1. Remove gibs, clean ways, lubricate, and properly adjust gibs (**Page 64**). 2. Adjust gibs (**Page 64**). 3. Properly adjust cross slide leadscrew backlash (**Page 65**). 4. Clean and lubricate bedways. 5. Inspect/replace gearing.
Inaccurate turning results from one end of workpiece to the other.	1. Tailstock not properly aligned with headstock.	1. Properly align tailstock with headstock (**Page 36**).
Chuck jaws will not move or do not move easily.	1. Chips/debris lodged in jaws.	1. Remove jaws, clean and lubricate jaws, scroll-gear threads, and chuck, then replace jaws.
Tailstock quill will not feed out of tailstock.	1. Quill lock is tightened down.	1. Turn quill lock counterclockwise to loosen.

Adjusting Gibs

Gibs control the movement accuracy of the sliding components—saddle, table, compound slide and tailstock. The gibs are sliding plates that either increase or decrease pressure on the sliding surfaces around them.

The goal of gib adjustment is to remove unnecessary sloppiness without causing the ways to bind. Tight gibs make the movements more accurate, but harder to perform. Loose gibs make the movements sloppy, but easier to perform

NOTICE

Excessively loose gibs may cause poor workpiece finishes, and may cause undue wear of the sliding surfaces. Over-tightening the gibs may cause premature wear of these sliding surfaces.

Saddle and Table Gibs

Tools Needed	Qty
Wrench 14mm	1
Hex Wrench 4mm	1

To adjust the saddle and table gibs:

1. DISCONNECT MACHINE FROM POWER!

2. Loosen the jam nuts shown in **Figure 102**.

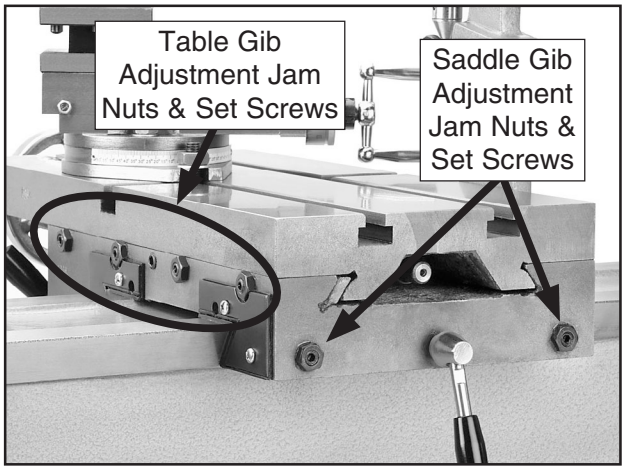


Figure 102. Table and saddle gib adjustment fasteners.

3. Make adjustments in small and equal increments to the set screws, then test the movement of the slide by rotating the handwheel.

Note: *Turning the set screws clockwise will tighten the gib, and turning them counter-clockwise will loosen the gib.*

4. When you are satisfied with the gib adjustment, keep the set screws from moving and tighten the hex nut to secure the settings.

5. Re-check the movement of the slide and, if necessary, repeat **Steps 2–4**.

Compound Gib

Tools Needed	Qty
Wrench 8mm	1
Standard Screwdriver Small	1

To adjust the compound gib:

1. DISCONNECT MACHINE FROM POWER!

2. Loosen the jam nuts shown in **Figure 103**.

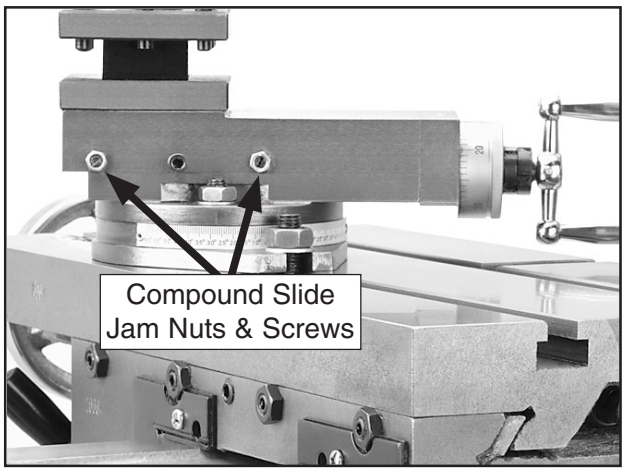


Figure 103. Compound slide gib adjustment fasteners.

3. Make adjustments in small and equal increments to the screws, then test the movement of the slide by rotating the handwheel.

   Note: *Turning the screws clockwise will tighten the gib, and turning them counterclockwise will loosen the gib.*

4. When you are satisfied with the gib adjustment, keep the screws from moving and tighten the hex nut to secure the settings.

5. Re-check the movement of the slide and, if necessary, repeat **Steps 2–4**.

Tailstock Gib

Tools Needed	Qty
Hex Wrench 4mm	1

To adjust the tailstock gib:

1. Make adjustments in small and equal increments to the set screws shown in **Figure 104**, then test the movement of the tailstock along the bedway.

   Note: *Turning the set screws clockwise will tighten the gib, and turning them counterclockwise will loosen the gib.*

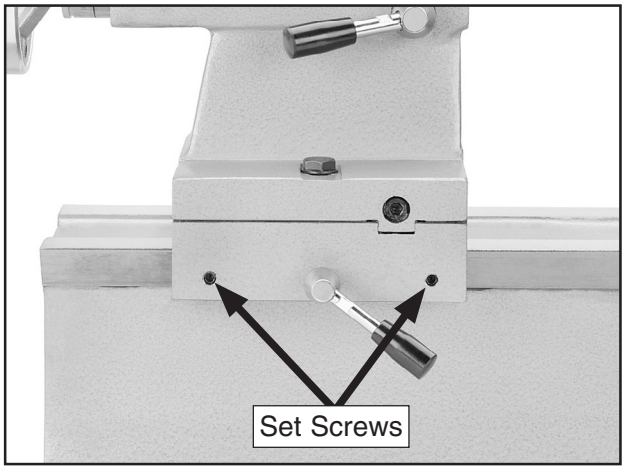


Figure 104. Tailstock gib adjustment set screws.

Adjusting Table Backlash

Backlash is the amount of play in a leadscrew. It is felt when turning the handwheel in one direction, then turning it in the other direction. The distance that the handwheel moves without moving the leadscrew or attached components is the backlash.

When adjusting the backlash, tighten the leadscrew nut enough to remove excessive backlash, but not so much that the nut binds the leadscrew, making it hard to turn. Over-tightening will cause excessive wear to the leadscrew and nut.

Tools Needed	Qty
Standard Screwdriver	1

To adjust the table backlash:

1. DISCONNECT MACHINE FROM POWER!

2. Use the handwheel to move the table toward the operator until you can access the leadscrew nut adjustment screws from the rear of the table, as shown in **Figure 105**.

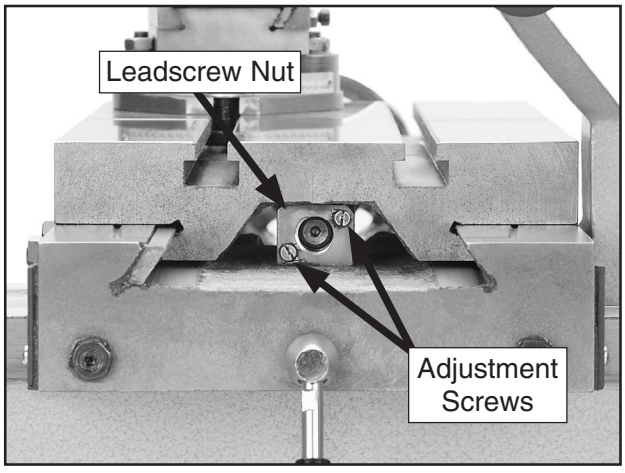


Figure 105. Table leadscrew nut and adjustment screws (viewed from the rear of the table).

3. Turn the adjustment screws in small and equal increments, then turn the table handwheel to test the backlash.

Adjusting Half-Nut

Over time and with normal wear, the half-nut may become excessively loose when it engages the leadscrew. The half-nut gib is a flat bar that exerts pressure against the half-nut mechanism. The goal of the half-nut adjustment is to remove unnecessary looseness as the half-nut engages the leadscrew without binding it so tight that it will not release.

Tools Needed	Qty
Hex Wrench 5mm	1
Hex Wrench 8mm	1
Standard Screwdriver Small	1

To adjust the half-nut:

1. DISCONNECT MACHINE FROM POWER!

2. Remove the thread dial and bushing from the right side of the apron.

3. Loosen the two jam nuts shown in **Figure 106**, then rotate the adjustment screws.

   Note: *Turn the screws clockwise to tighten the gib, and counterclockwise to loosen it.*

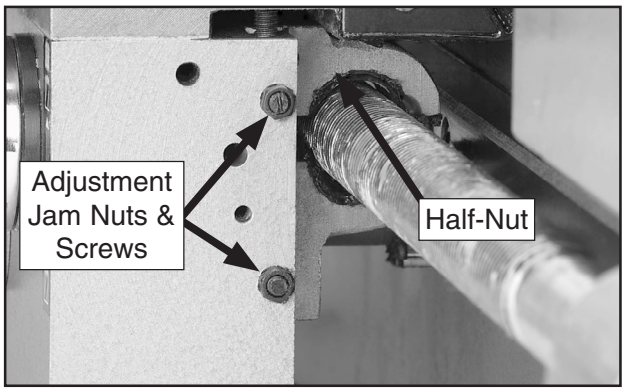


Figure 106. Half-nut gib adjustment jam nuts and screws (viewed with thread dial removed).

4. Engage the half-nut with the leadscrew, then manually rock the carriage back-and-forth while observing the half-nut for looseness.

5. When you are satisfied with the adjustment, keep the adjustment screws from turning while you re-tighten the jam nuts, then re-install the thread dial and bushing.

Replacing Shear Pins

The longitudinal leadscrew is secured to the feed rate gearing in the headstock with the use of soft-metal shear pins (see **Figure 107**). The shear pins are designed to break and disengage power to the leadscrew to help protect more expensive lathe components if you crash your carriage or take too large of a cut and overload the lathe.

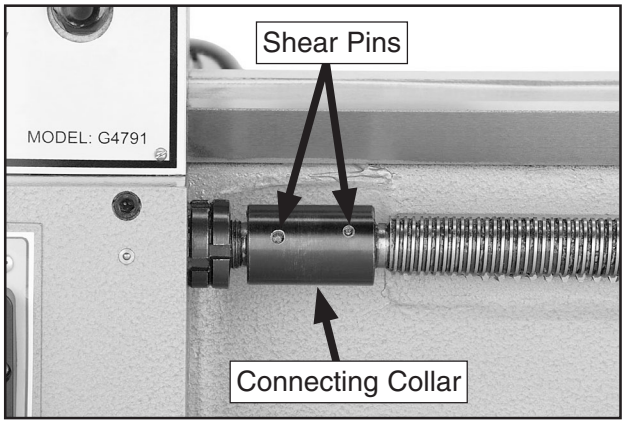


Figure 107. Longitudinal leadscrew shear pins.

Tools Needed	Qty
Punch 4mm	1
Hammer	1

To replace a shear pin:

1. DISCONNECT MACHINE FROM POWER!

2. Rotate the leadscrew so the shear pin faces up and down. If the connection collar rotates independently from the leadscrew, then rotate the collar so the shear pin holes align with those is the leadscrew.

3. Use the punch and hammer to drive out the pieces of the old shear pin.

4. Make sure the holes in the collar and leadscrew are clear of debris and are aligned, then tap the new shear pin through the holes.

Lathe Bearing Preload

This lathe is shipped from the factory with the lathe spindle bearing preload properly adjusted. If the spindle ever develops excessive end-play and the workpiece finish suffers, you can adjust the bearing preload to remove the unnecessary end-play and improve the workpiece finish.

Note: *Lathe spindle end-play can be felt when attempting to move the spindle toward and away from the headstock.*

Tools Needed	**Qty**
Spanner Wrench 3"	1
Dial Indicator with Magnetic Base	1
Heavy Dead Blow Hammer	1
Wooden Block	1

To adjust the lathe spindle bearing preload:

1. Run the lathe for approximately 20 minutes on a high speed to bring the lathe to its normal operating temperature.

2. DISCONNECT MACHINE FROM POWER!

3. Remove the chuck or faceplate from the lathe spindle, then open the change gear cabinet to expose the outboard end of the spindle (see **Figure 108**).

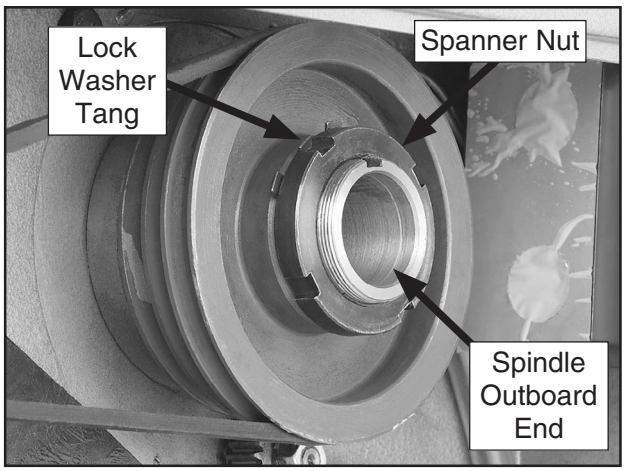


Figure 108. Lathe spindle outboard end.

4. Flatten the bent tang of the spanner lock washer where it engages the indent of the spanner nut so that the spanner nut can be rotated.

5. Loosen the spanner nut one full turn counter-clockwise.

   Note: *You may have to tap on the outboard spindle tube as explained in **Step 6** to help unload the spindle preload and break the spanner nut loose.*

6. Place a wooden block over the outboard end of the spindle, and hit it soundly with the heavy dead blow hammer (see **Figure 109**). Your goal is to slide the spindle forward just enough to introduce spindle end-play that you can feel by hand.

   Note: *Spindle end-play is felt when you can move the spindle nose toward and away from the lathe head.*

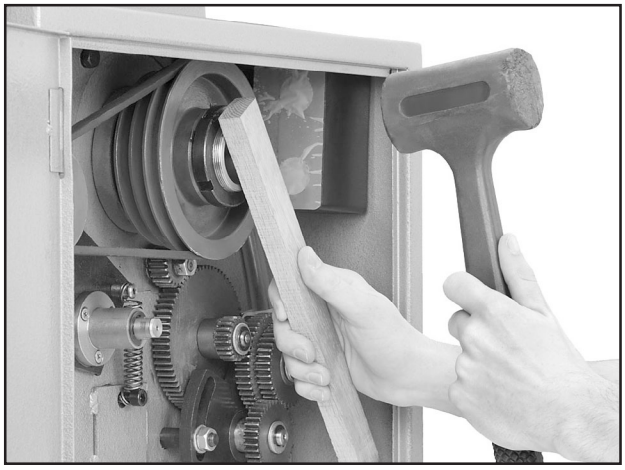


Figure 109. Introducing detectable spindle end-play.

NOTICE

Adjusting the lathe spindle preload is a fairly complex procedure that requires precise measurements. If you are not comfortable performing this procedure, get assistance from an experienced professional.

7. Place a dial indicator on the table and move the carriage toward the spindle until the indicator plunger lightly touches the spindle face and the dial reads exactly zero (see **Figure 110**).

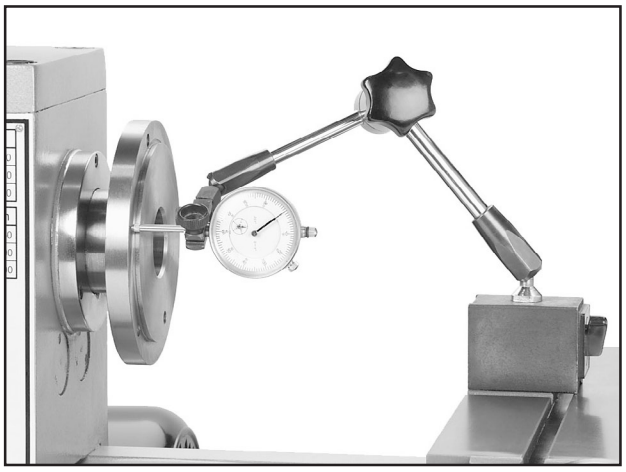


Figure 110. Dial indicator setup.

8. Move the carriage an additional 0.100" toward the spindle.

9. Insert the handle of a chuck key into a spindle indent to keep the spindle from rotating, then tighten the spanner nut until the indicator dial needle just stops moving and is back to exactly zero.

Note: *While tightening the spanner nut, rock the spindle back-and-forth, slightly to make sure the spindle tapered roller bearings seat properly in their races.*

When the dial indicator needle stops moving, there will be no spindle end-play and no bearing preload. It is essential that you find this point without tightening the spanner nut too much and inadvertently preloading the spindle bearings.

Since it takes great effort to turn the spanner nut, you may find it difficult to know if you have gone past the zero end-play point or not. It is easiest to have someone watch the dial while you tighten the inner spanner nut. If you think you may have gone past the zero end-play point, take the time to unload the bearings as described earlier, then re-tighten the spanner nut until you know you have reached the correct setting.

10. When you are confident that you have adjusted the spanner nut until zero spindle end-play and preload exist, tighten the spanner nut an additional 3⁄16" clockwise along its circumference to introduce the correct amount of spindle bearing preload (see **Figure 111**).

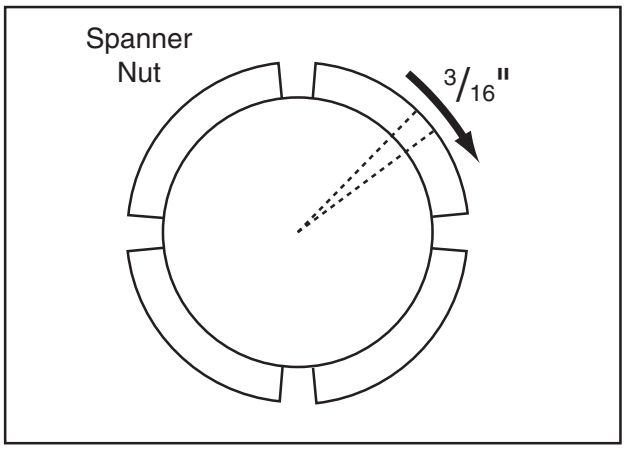


Figure 111. The final distance to rotate the spanner nut along its circumference.

11. Without moving the spanner nut, bend a lock washer tang into one of the spanner nut indents to secure the setting.

Note: *It may only be possible to partially engage a lock washer tang with the spanner nut, which will be sufficient.*

12. Close and secure the change gear cabinet.

To confirm that the spindle bearings are correctly preloaded:

1. Install the 3-jaw chuck and tighten the jaws into the center.

2. Set the lathe spindle speed to a medium setting.

3. Connect the machine to power and turn the lathe spindle ***ON***.

4. Let the lathe run for 20 minutes.

5. Turn the lathe ***OFF***, disconnect the machine from power, remove the chuck, then check the temperature of the spindle inner surface.

—If the spindle is slightly warm to the touch, you have established the correct bearing preload.

—If the spindle is hotter than you can comfortably keep your hand on, the preload is too tight and you must repeat the bearing preload adjustment procedure. When repeating the procedure, rotate the spanner nut a little less during **Step 10**.

SECTION 9: WIRING

These pages are current at the time of printing. However, in the spirit of improvement, we may make changes to the electrical systems of future machines. Study this diagram carefully. If you notice differences between your machine and these wiring diagrams, call Technical Support at (570) 546-9663 for assistance.

⚠WARNING
Electrical Safety Instructions

1. **SHOCK HAZARD.** Disconnect the power from the machine before servicing electrical components. Touching electrified parts will result in personal injury including but not limited to severe burns, electrocution, or death.

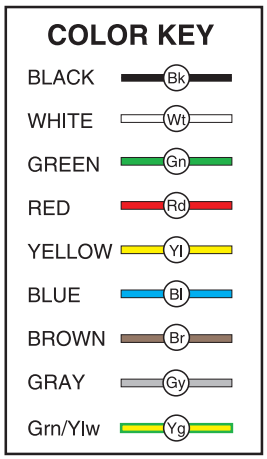
2. **CIRCUIT REQUIREMENTS.** You MUST follow the **CIRCUIT REQUIREMENTS** section on **Page 11**. **If you are unsure about the wiring codes in your area or you plan to connect your machine to a shared circuit, consult a qualified electrician.**

3. **GROUNDED CIRCUIT.** Electrocution or fire could result if the machine is not grounded and installed in compliance with electrical codes. Compliance MUST be verified by a qualified electrician.

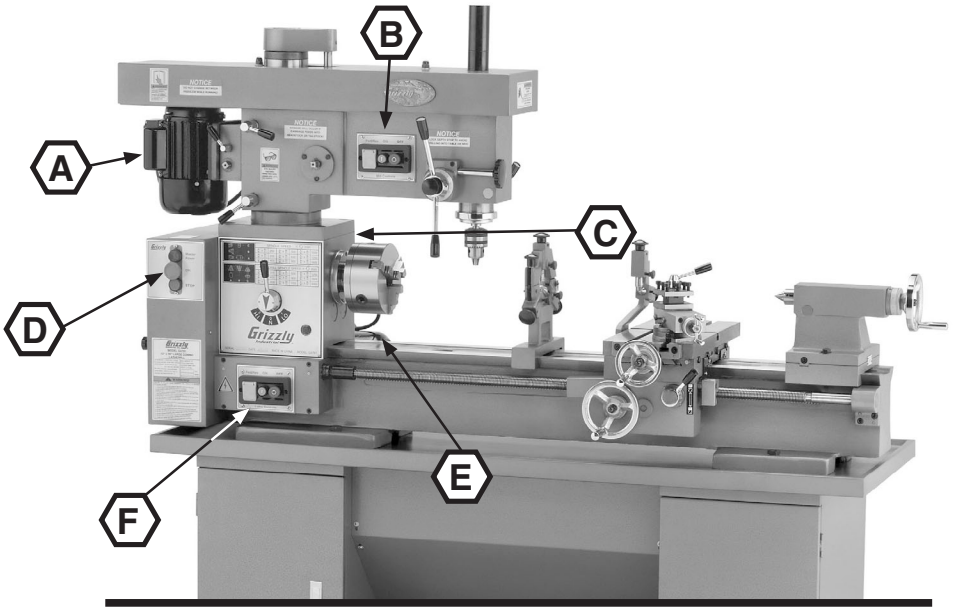
4. **MOTOR WIRING.** The motor wiring shown in these diagrams are current at the time of printing, but it may not match your machine. Always use the wiring diagram on the motor.

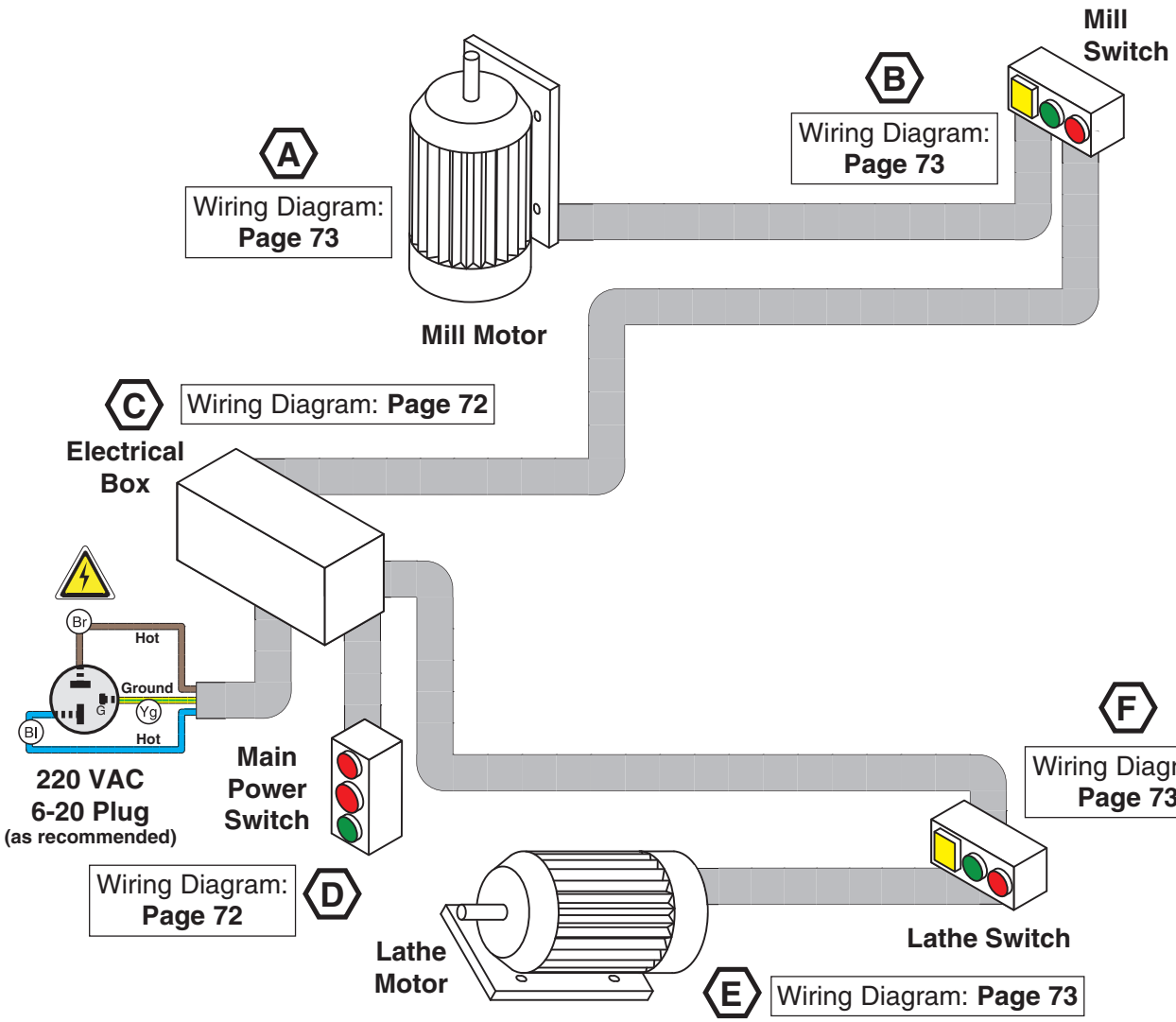
5. **EXPERIENCING DIFFICULTIES.** If at any time you are experiencing difficulties understanding the information included in this section, contact our Technical Support at (570) 546-9663.

NOTICE
The photos and diagrams included in this section are best viewed in color. You can view these pages in color at *www.grizzly.com.*



Wiring Overview





Electrical Component Wiring Diagrams

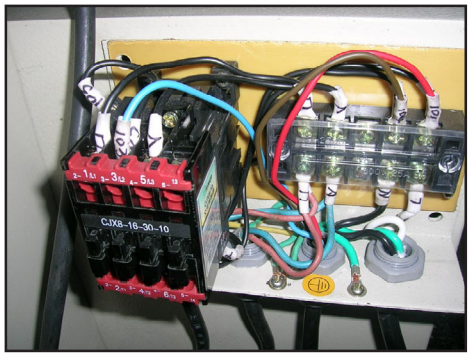
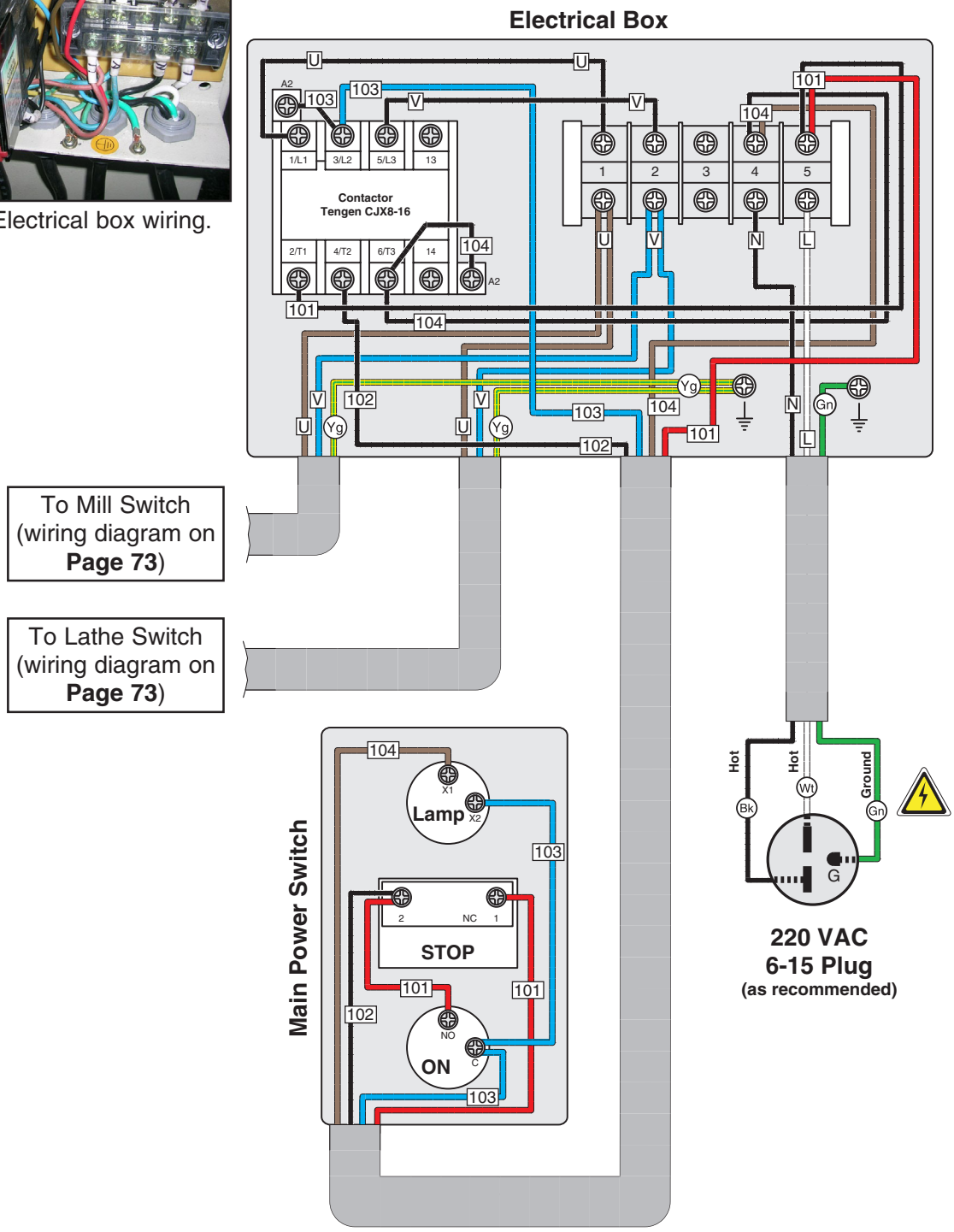


Figure 112. Electrical box wiring.



READ ELECTRICAL SAFETY ON PAGE 70!

Electrical Component Wiring Diagrams

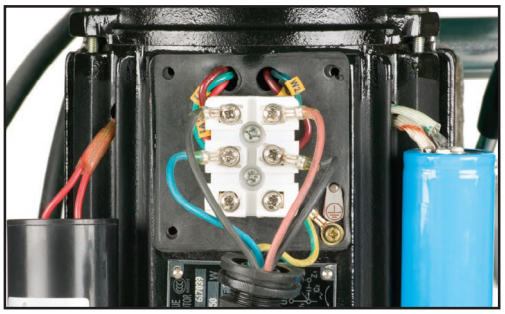


Figure 113. Mill motor wiring.

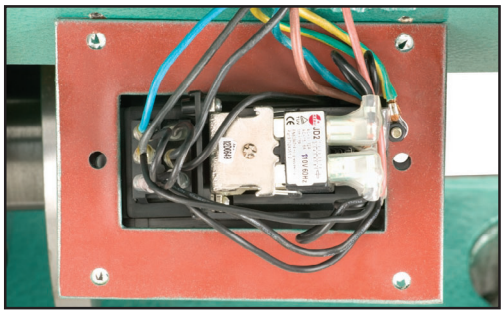
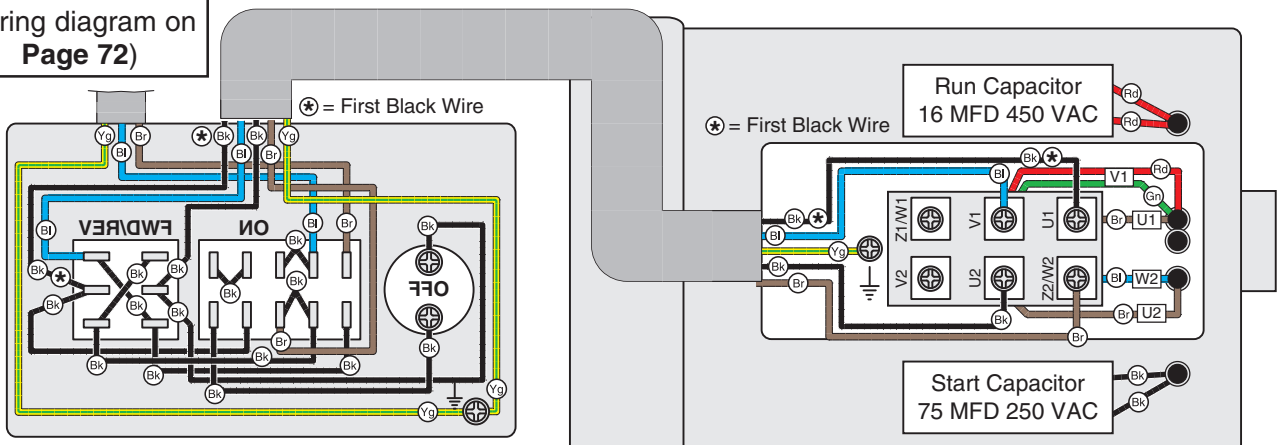


Figure 115. Mill switch wiring.

To Electrical Box (wiring diagram on **Page 72**)



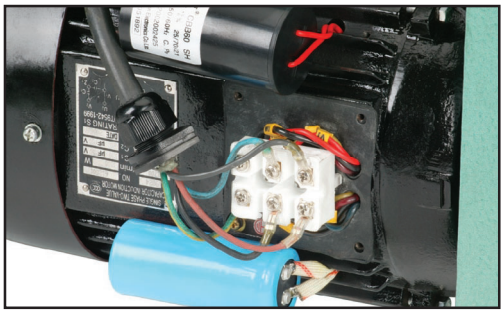


Figure 114. Lathe motor wiring.

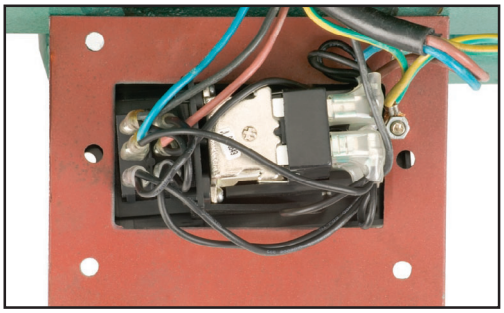
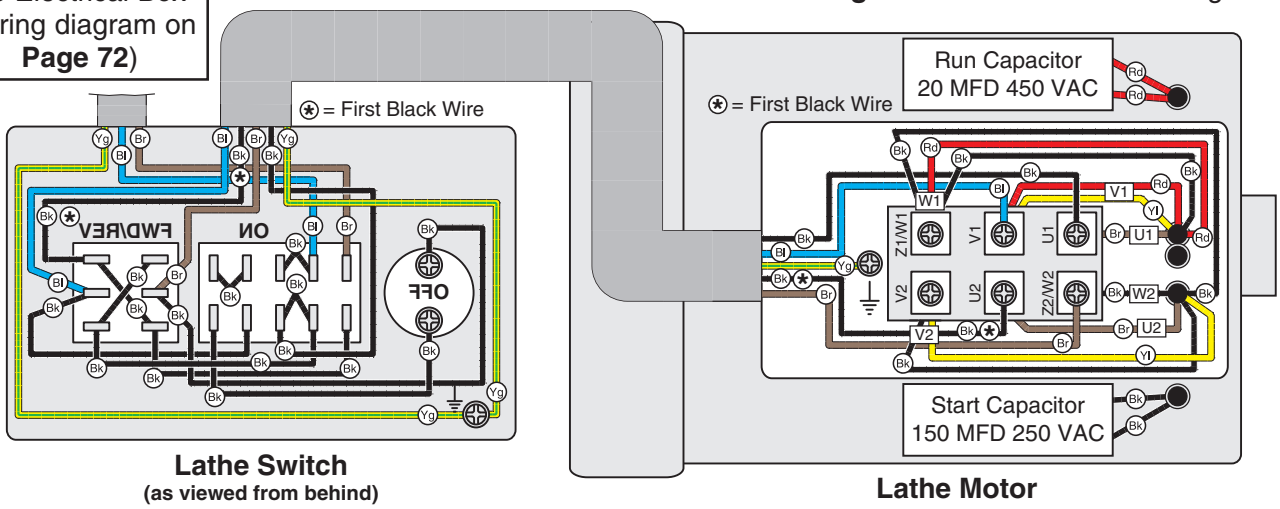


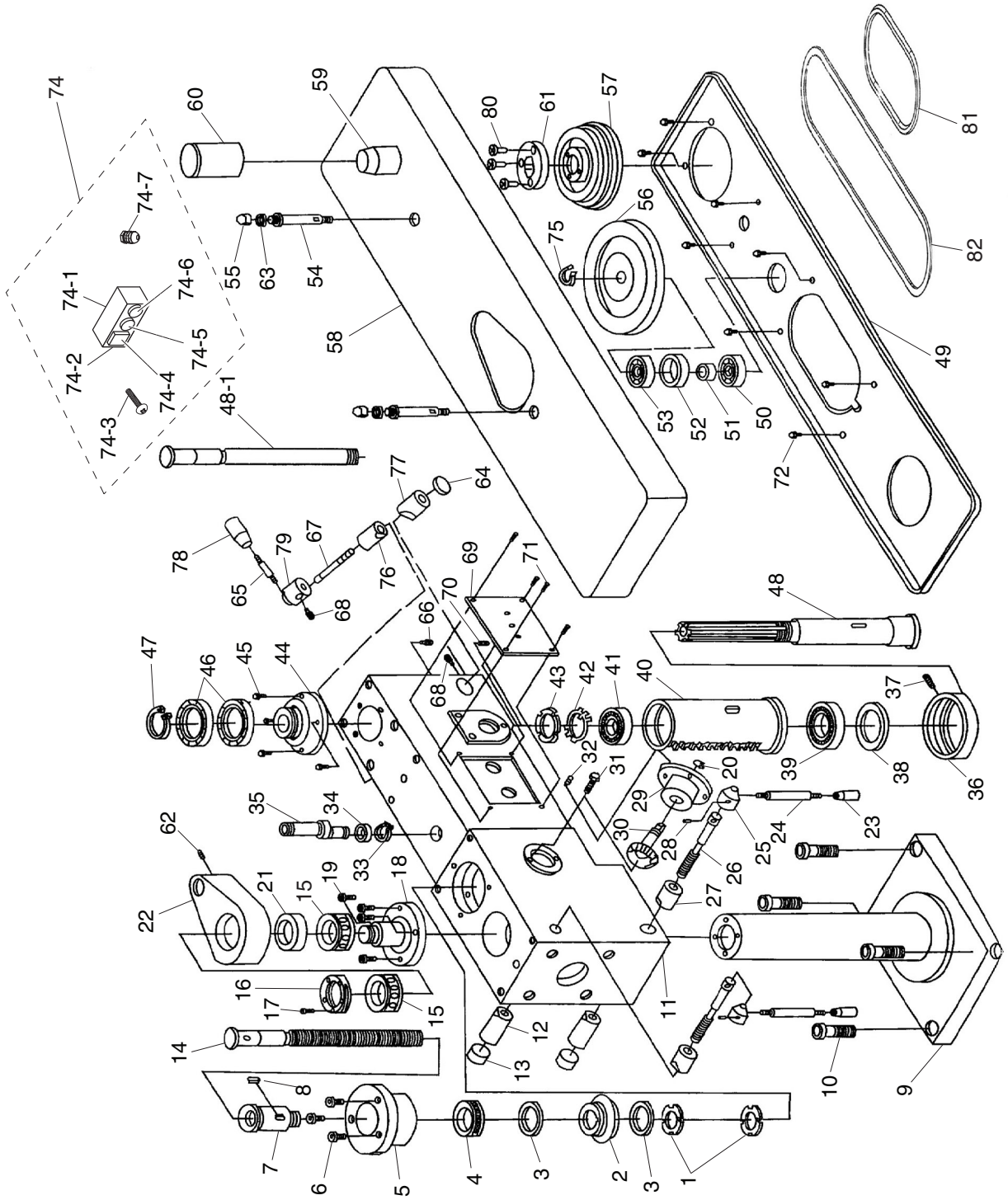
Figure 116. Lathe switch wiring.

To Electrical Box (wiring diagram on **Page 72**)



SECTION 10: PARTS

Mill Head Breakdown

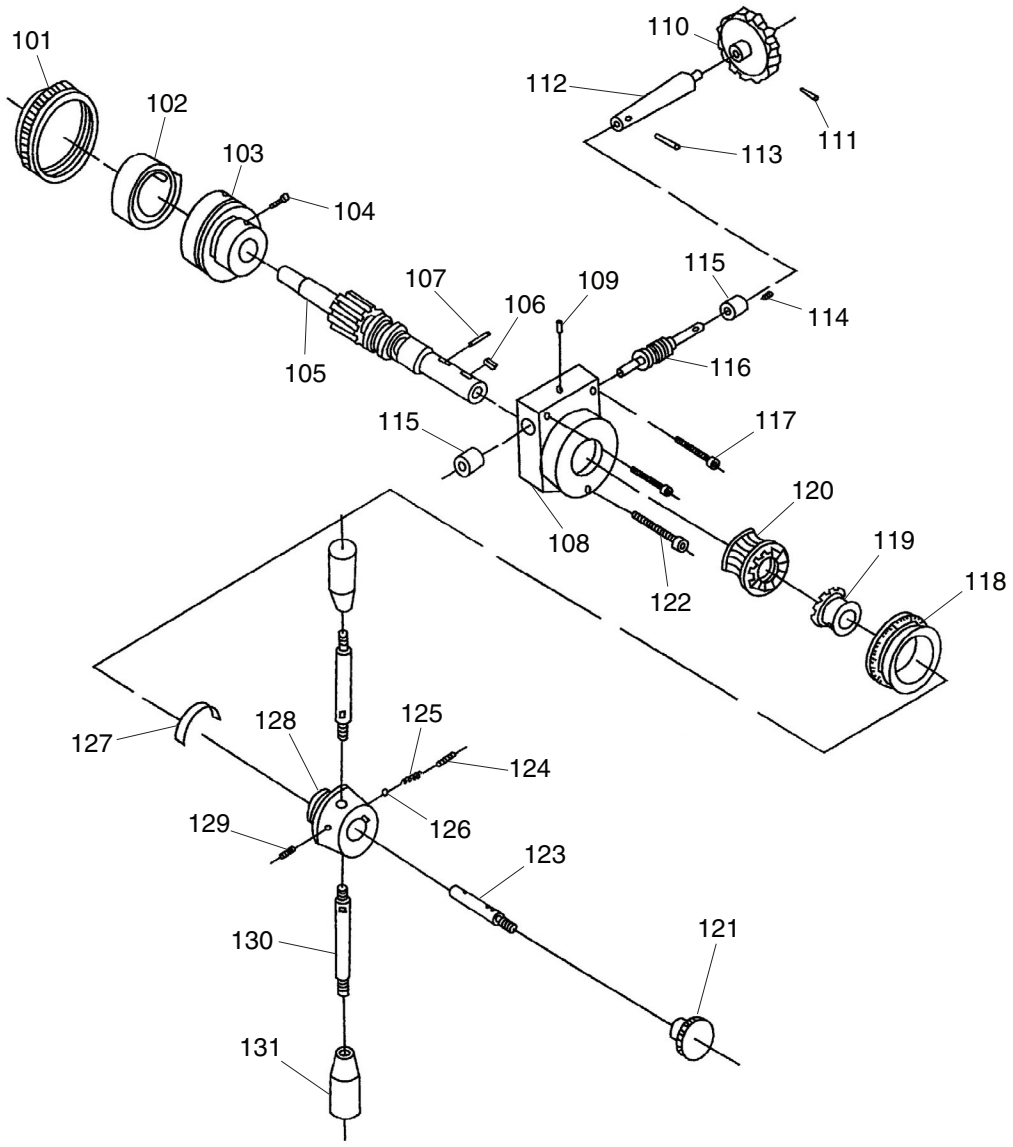


Mill Head Parts List

REF	PART #	DESCRIPTION
1	P4791001	SPANNER NUT M30-1.5
2	P4791002	BEVEL GEAR 46T
3	P4791003	SPACER
4	P8107	THRUST BEARING 8107
5	P4791005	LEADSCREW NUT BRACKET
6	PSB13M	CAP SCREW M8-1.25 X 30
7	P4791007	ELEVATION LEADSCREW NUT
8	PK60M	KEY 8 X 8 X 15
9	P4791009	MILL COLUMN
10	P4791010	CAP SCREW M16-2 X 35
11	P4791011	MILL HEADSTOCK CASTING
12	P4791012	LOCK PLUNGER
13	P4791013	SPECIAL HEX NUT
14	P4791014	ELEVATION LEADSCREW
15	P8108	THRUST BEARING 8108
16	P4791016	LOCK COLLAR M36-1.5
17	PS05M	PHLP HD SCR M5-.8 x 8
18	P4791018	MILL COLUMN BRACKET
19	PSB31M	CAP SCREW M8-1.25 X 25
20	PR07M	EXT RETAINING RING 18MM
21	P4791021	BUSHING
22	P4791022	COLUMN COVER
23	P4791023	LONG KNOB B8 X 40
24	P4791024	HANDLE M8-1.25 X 40
25	P4791025	HANDLE HUB
26	P4791026	LOCK BOLT
27	P4791027	LOCK BOLT SLEEVE
28	P4791028	TAPER PIN 4 X 28
29	P4791029	GEAR SHAFT BRACKET
30	P4791030	BEVEL GEAR SHAFT 30T
31	PB08M	HEX BOLT M6-1 X 20
32	PSS17M	SET SCREW M8-1.25 X 6
33	PR09M	EXT RETAINING RING 20MM
34	P4791034	BUSHING
35	P4791035	CAM SHAFT
36	P4791036	BEARING CAP
37	PSS07M	SET SCREW M5-.8 X 5
38	P4791038	FELT COLLAR
39	P4791039	TAPERED ROLLER BEARING 7108
40	P4791040	MILL QUILL
41	P4791041	TAPERED ROLLER BEARING 7107
42	P4791042	SPANNER LOCK WASHER 35MM
43	P4791043	SPANNER NUT M35-1.5
44	P4791044	BEARING CAP
45	PB148M	HEX BOLT M5-.8 X 16

REF	PART #	DESCRIPTION
46	P4791046	ROLLING BEARING 109
47	PR56M	EXT RETAINING RING 45MM
48	P4791048	MILL SPINDLE
48-1	P4791048-1	DRAW BAR
49	P4791049	MILL DRIVE SYSTEM BASE
50	P4791050	ROLLING BEARING 204
51	P4791051	SPACER
52	P4791052	BUSHING
53	P4791050	ROLLING BEARING 204
54	P4791054	THREADED SHAFT
55	PN43M	ACORN NUT M10-1.5
56	P4791056	IDLER PULLEY
57	P4791057	SPINDLE PULLEY
58	P4791058	MILL DRIVE SYSTEM COVER
59	P4791059	SPINDLE CAP BASE
60	P4791060	SPINDLE CAP
61	P4791061	PULLEY CAP
62	PSS14M	SET SCREW M8-1.25 X 12
63	PW04M	FLAT WASHER 10MM
64	P4791064	LOCK PLUNGER CAP
65	P4791065	HANDLE M10-1.25 X 50
66	PSB76M	CAP SCREW M8-1.25 X 18
67	P4791067	LOCK BOLT M10 X 50
68	PSS06M	SET SCREW M8-1.25 X 16
69	P4791069	SWITCH PANEL
70	PSS41M	SET SCREW M8-1.25 X 18
71	PS52M	PHLP HD SCR M4-.7 X 20
72	PS09M	PHLP HD SCR M5-.8 X 10
74	P4791074	MILL SWITCH ASSEMBLY
74-1	P479174-1	ELECTRICAL BOX
74-2	P479174-2	SWITCH COVER
74-3	PS36	PHLP HD SCR 10-24 X 2-1/2
74-4	P479174-4	FWD/REV SWITCH
74-5	P479174-5	ON SWITCH
74-6	P479174-6	OFF SWITCH
74-7	P4791941	STRAIN RELIEF
75	PEC08M	E-CLIP 16MM
76	P4791076	LOCK BOLT SLEEVE
77	P4791077	LOCK BOLT PLUNGER
78	P4791078	HANDLE KNOB
79	P4791079	HANDLE HUB
80	P4791080	SPECIAL SLOTTED SCREW
81	PVM37	V-BELT 3L370
82	PVM50	V-BELT 3L500

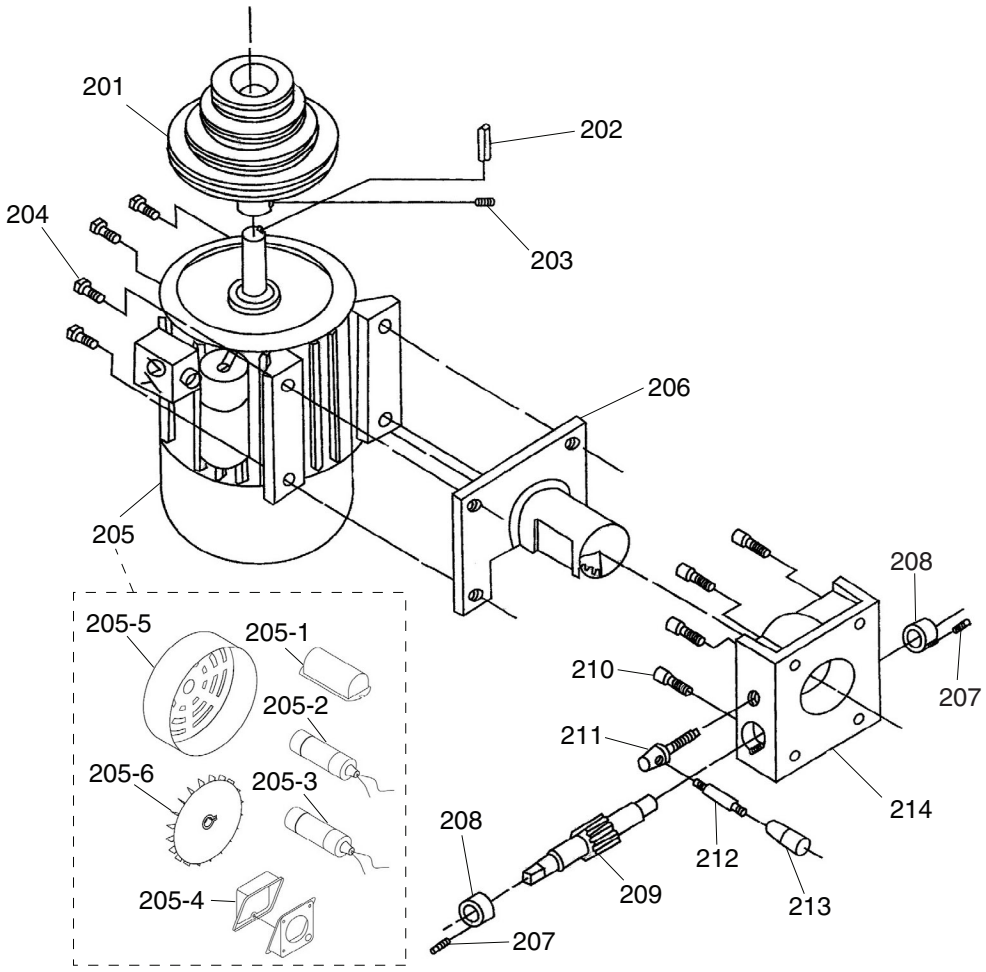
Downfeed Breakdown



REF	PART #	DESCRIPTION
101	P4791101	SPRING COVER
102	P4791102	COILED SPRING 0.8 X 20 X 1000
103	P4791103	SPRING SEAT
104	PS17M	PHLP HD SCR M4-.7 x 6
105	P4791105	GEAR SHAFT 18T
106	PK99M	KEY 6 X 6 X 15
107	P4791107	PIN 5 X 28
108	P4791108	WORM SEAT
109	P4791109	BALL OILER 8MM
110	P4791110	STAR KNOB
111	P4791111	TAPER PIN 3 x 18
112	P4791112	SHAFT
113	PRP02M	ROLL PIN 3 X 16
114	PSS31M	SET SCREW M5-.8 X 8
115	P4791115	WORM SLEEVE
116	P4791116	WORM

REF	PART #	DESCRIPTION
117	PSB07M	CAP SCREW M6-1 X 30
118	P4791118	GRADUATED DIAL
119	P4791119	CLUTCH SLEEVE
120	P4791120	WORM
121	P4791121	KNOB
122	PSB109M	CAP SCREW M5-.8 X 50
123	P4791123	SHAFT
124	PSS04M	SET SCREW M6-1 X 12
125	P4791125	COMPRESSION SPRING 0.6 X 5 X 15
126	P4791126	STEEL BALL 5MM
127	P4791127	SPRING PLATE
128	P4791128	HANDLE SEAT
129	PSS04M	SET SCREW M6-1 X 12
130	P4791130	HANDLE LEVER M10-1.5 X 100
131	P4791131	HANDLE KNOB M10-1.5 X 50

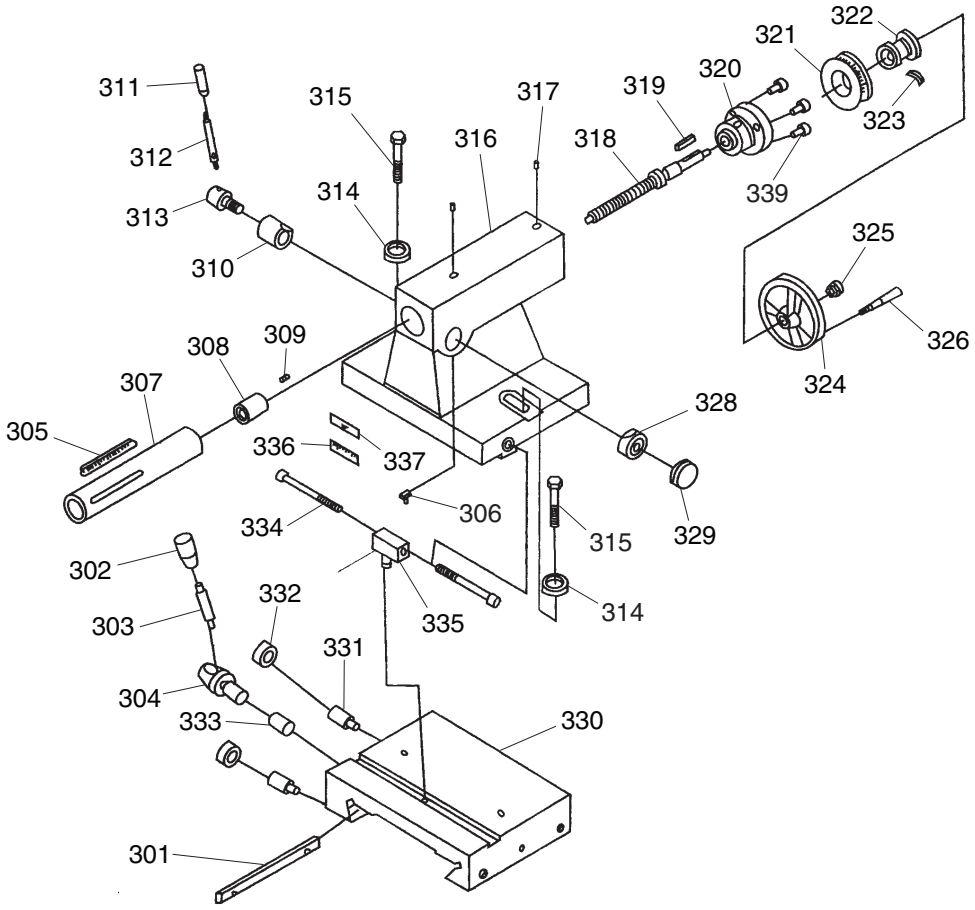
Mill Motor Breakdown



REF	PART #	DESCRIPTION
201	P4791201	MOTOR PULLEY
202	PK99M	KEY 6 X 6 X 15
203	PSS05M	SET SCREW M5-.8 X 10
204	PB85M	HEX BOLT M8-1.25 X 18
205	P4791205	MILL MOTOR 3/4HP 220V 1-PH
205-1	P4791205-1	CAPACITOR COVER
205-2	P4791205-2	S CAPACITOR 75M 250V 1-1/4 X 3-1/8
205-3	P4791205-3	R CAPACITOR 16M 450V 1-5/8 X 2-7/8
205-4	P4791205-4	MOTOR WIRING JUNCTION BOX
205-5	P4791205-5	MOTOR FAN COVER

REF	PART #	DESCRIPTION
205-6	P4791205-6	MOTOR FAN
206	P4791206	MOTOR MOUNT
207	PSS31M	SET SCREW M5-.8 X 8
208	P4791208	COLLAR
209	P4791209	GEAR SHAFT 12T
210	PSB76M	CAP SCREW M8-1.25 X 18
211	P4791211	HANDLE HUB
212	P4791212	HANDLE LEVER M6-1 X 36
213	P4791213	KNOB M6-1 X 25
214	P4791214	MOTOR BRACKET

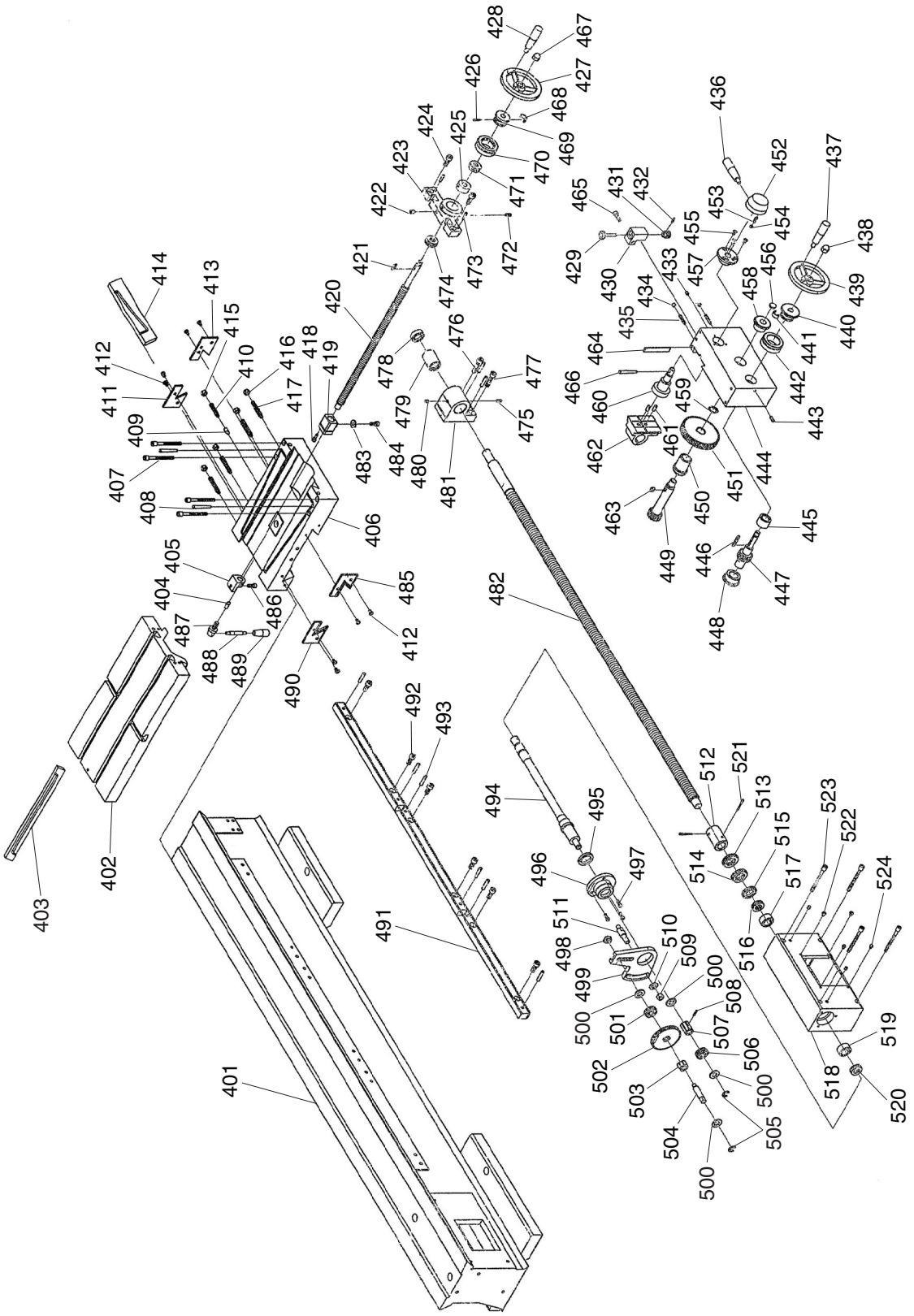
Tailstock Breakdown



REF	PART #	DESCRIPTION
301	P4791301	TALESTOCK GIB
302	P4791302	KNOB M6-1 X 36
303	P4791303	HANDLE M6-1 X 40
304	P4791304	HANDLE HUB
305	P4791305	GRADUATED LABEL
306	P4791306	SPECIAL T-NUT
307	P4791307	TAILSTOCK QUILL
308	P4791308	COLLAR
309	PSS05M	SET SCREW M5-.8 X 10
310	P4791310	LOCK PLUNGER
311	P4791311	KNOB
312	P4791312	HANDLE
313	P4791313	HANDLE HUB
314	PW04M	FLAT WASHER 10MM
315	PB116M	HEX BOLT M10-1.5 X 45
316	P4791316	TAILSTOCK CASTING
317	P4791109	BALL OILER 8MM
318	P4791318	TAILSTOCK LEADSCREW
319	PK125M	KEY 4 X 4 X 28

REF	PART #	DESCRIPTION
320	P4791320	TAILSTOCK LEADSCREW NUT
321	P4791321	GRADUATED DIAL
322	P4791322	BUSHING
323	P4791323	SPRING PLATE
324	P4791324	HANDWHEEL
325	PN43M	ACORN NUT M10-1.5
326	P4791326	HANDWHEEL HANDLE
328	P4791328	LOCK PLUNGER
329	P4791329	PLUG
330	P4791330	TAILSTOCK BASE
331	PSS19M	SET SCREW M8-1.25 X 30
332	PN03M	HEX NUT M8-1.25
333	P4791333	LOCK PLUNGER
334	PSB106M	CAP SCREW M8-1.25 X 90
335	P4791335	ADJUSTMENT NUT
336	P4791336	OFFSET LABEL
337	P4791337	INDICATOR LABEL
339	P4791339	SPECIAL CAP SCREW

Bed Breakdown



Bed Parts List

REF	PART #	DESCRIPTION
401	P4791401	BED
402	P4791402	TABLE
403	P4791403	TABLE GIB
404	P4791404	LOCK PLUNGER
405	P4791405	BRACKET
406	P4791406	SADDLE
407	PSB49M	CAP SCREW M6-1 X 60
408	P4791408	TAPER PIN 5 X 45
409	P4791409	LOCK PLUNGER
410	PSS84M	SET SCREW M10-1.5 X 35
411	P4791411	WIPER RIGHT REAR
412	PS09M	PHLP HD SCR M5-.8 X 10
413	P4791413	WIPER RIGHT FRONT
414	P4791414	SADDLE GIB
415	PN02M	HEX NUT M10-1.5
416	PN03M	HEX NUT M8-1.25
417	PSS42M	SET SCREW M8-1.25 X 50
418	PSB16M	CAP SCREW M4-.7 X 16
419	P4791419	CROSS LEADSCREW NUT
420	P4791420	CROSS LEADSCREW
421	PK134M	KEY 4 X 4 X 14
422	P4791109	BALL OILER 8MM
423	P4791423	CROSS LEADSCREW BRACKET
424	PSB11M	CAP SCREW M8-1.25 X 16
425	P4791425	BUSHING
426	PRP56M	ROLL PIN 4 X 25
427	P4791427	HANDWHEEL 12-1.75 X 100
428	P4791428	HANDLE W/ SLEEVE M6-1 X 65
429	P4791429	THREAD DIAL
430	P4791430	THREAD DIAL BODY
431	P4791431	WORM
432	PRP61M	ROLL PIN 3 X 12
433	P4791109	BALL OILER 8MM
434	PN06M	HEX NUT M5-.8
435	PSS27M	SET SCREW M5-.8 X 30
436	P4791436	HANDLE
437	P4791437	HANDLE W/ SLEEVE
438	PN43M	ACORN NUT M10-1.5
439	P4791439	HANDWHEEL B12-1.75 X 125
440	P4791440	BEARING SLEEVE
441	P4791441	SPRING PLATE
442	P4791442	GRADUATED DIAL
443	PSS34M	SET SCREW M5-.8 X 16
444	P4791444	APRON
445	P4791445	BUSHING
446	PK31M	KEY 4 X 4 X 30
447	P4791447	GEAR SHAFT 20T
448	P4791448	END CAP
449	P4791449	GEAR SHAFT 14T
450	P4791450	SLEEVE

REF	PART #	DESCRIPTION
451	P4791451	GEAR 60T
452	P4791452	HANDLE HUB
453	P4791453	COMPRESSION SPRING .8 X 5 X 25
454	P4791454	STEEL BALL 6.5MM
455	PFH25M	FLAT HD SCR M4-.7 X 12
456	P4791456	END CAP
457	P4791457	GEAR SHAFT BRACKET
458	P4791458	BEARING SLEEVE
459	PR09M	EXT RETAINING RING 20MM
460	P4791460	SWITCH SHAFT
461	PK81M	KEY 6 X 6 X 12
462	P4791462	HALF-NUT
463	PK81M	KEY 6 X 6 X 12
464	P4791464	HALF-NUT GIB
465	PSB06M	CAP SCREW M6-1 X 25
466	PRP30M	ROLL PIN 5 X 50
467	PN43M	ACORN NUT M10-1.5
468	P4791468	SPRING PLATE
469	P4791469	COLLAR
470	P4791470	GRADUATED DIAL
471	P4791471	ROLLER BEARING GB301-84
472	PSS05M	SET SCREW M5-.8 X 10
473	PRP26M	ROLL PIN 5 X 26
474	P4791474	ROLLER BEARING GB301-84
475	PSS05M	SET SCREW M5-.8 X 10
476	P4791476	TAPER PIN 6 X 32
477	PSB13M	CAP SCREW M8-1.25 X 30
478	P4791478	END CAP
479	P4791479	BUSHING
480	P4791109	BALL OILER 8MM
481	P4791481	LEADSCREW BRACKET
482	P4791482	LONGITUDINAL LEADSCREW
483	PSB01M	CAP SCREW M6-1 X 16
484	PW03M	FLAT WASHER 6MM
485	P4791485	WIPER LEFT FRONT
486	PSB01M	CAP SCREW M6-1 X 16
487	P4791487	HANDLE HUB
488	P4791488	HANDLE M6-1 X 40
489	P4791489	KNOB M6-1 X 30
490	P4791490	WIPER LEFT REAR
491	P4791491	RACK
492	PSB58M	CAP SCREW M8-1.25 x 12
493	PRP08M	ROLL PIN 6 X 30
494	P4791494	CHANGE GEAR SHAFT
495	P4791495	COLLAR
496	P4791496	BRACKET
497	PB173M	HEX BOLT M4-.7 X 20
498	P4791498	SPECIAL T-NUT
499	P4791499	CHANGE GEAR PIVOT
500	PW06M	FLAT WASHER 12MM

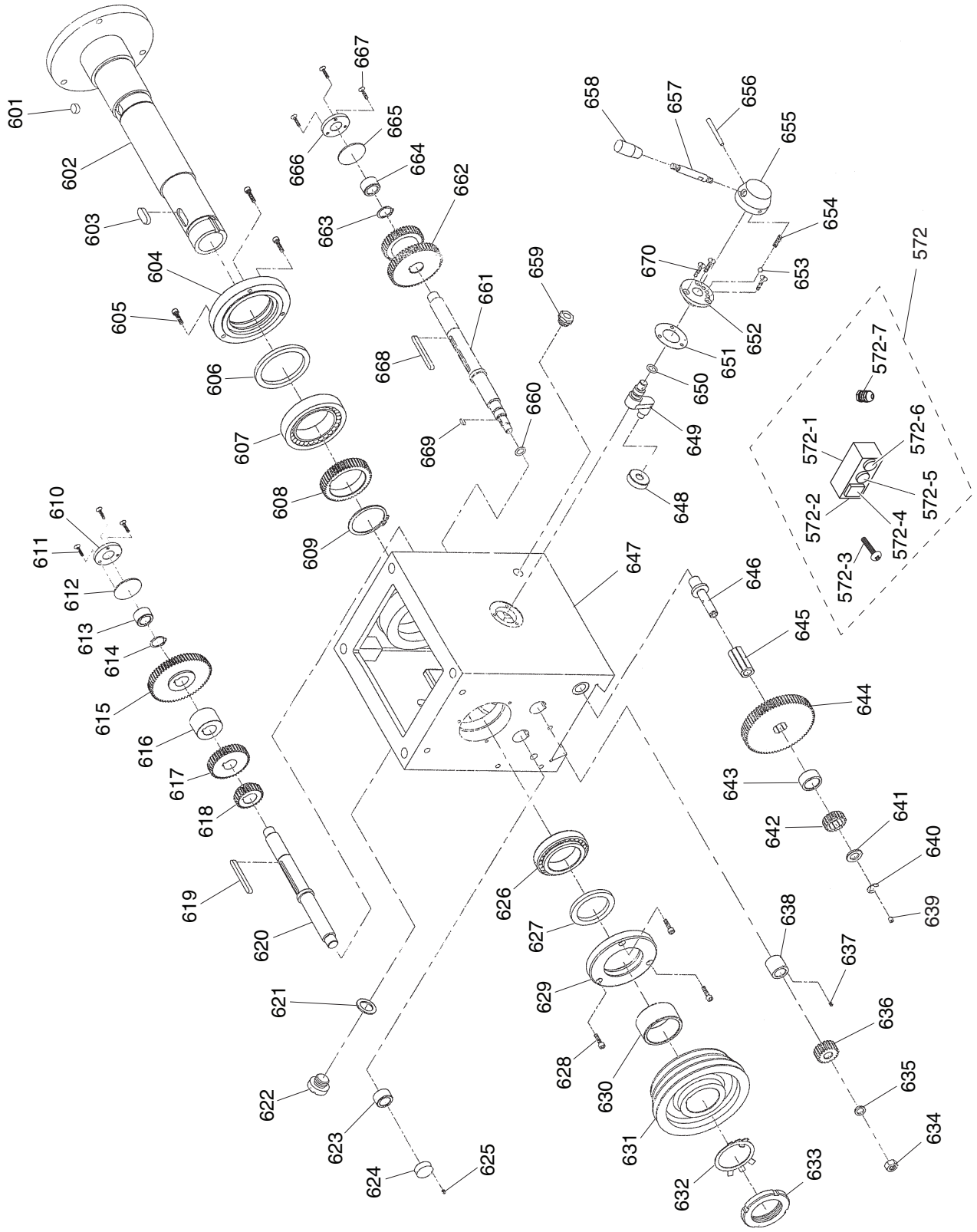
Bed Parts List

REF	PART #	DESCRIPTION
501	P4791501	CHANGE GEAR 20T
501A	P4791501A	CHIP PAN
502	P4791502	CHANGE GEAR 35T
503	P4791503	SPLINE
504	P4791504	SHAFT
505	PEC10M	E-CLIP 9MM
506	P4791506	CHANGE GEAR 26T
507	P4791507	SPLINE
508	PK98M	KEY 3 X 3 X 16
509	PN02M	HEX NUT M10-1.5
510	PW04M	FLAT WASHER 10MM
511	P4791511	STATIONARY SHAFT
512	P4791512	CONNECTING SLEEVE
513	P4791513	SPANNER NUT M20-1.5
514	P4791514	SPANNER NUT M20-1.5

REF	PART #	DESCRIPTION
515	P4791515	SPACER
516	P51104	THRUST BEARING 51104
517	P4791517	BUSHING
518	P4791518	GEARBOX CASTING
519	P4791519	BUSHING
520	P8105	THRUST BEARING 8105
521	P4791521	TAPER PIN 6 X 32
522	P4791109	BALL OILER 8MM
523	PSB42M	CAP SCREW M6-1 X 85
524	PS07M	PHLP HD SCR M4-.7 X 8
1000A	P47911000A	COMPLETE LEFT CABINET ASSY
1001A	P47911001A	COMPLETE RIGHT CABINET ASSY
1002	P47911002	CENTER PANEL
1003	P47911003	CENTER PANEL BRACKET LEFT
1004	P47911004	CENTER PANEL BRACKET RIGHT

* Not Shown

Lathe Head Breakdown

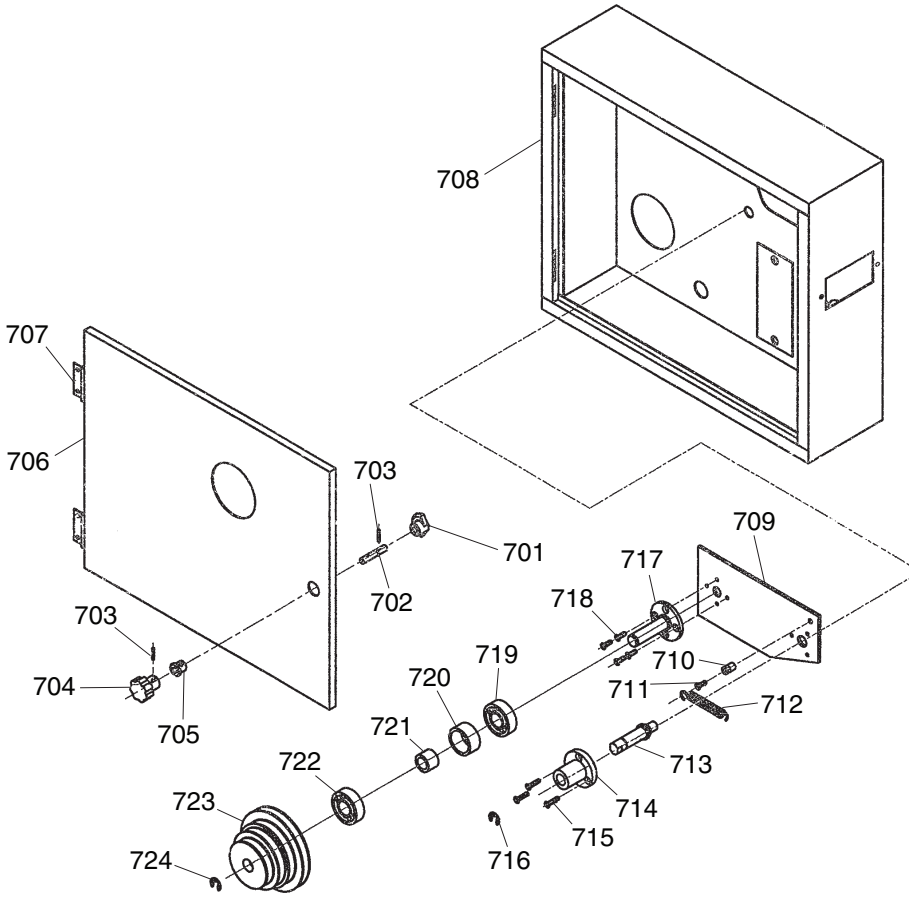


Lathe Head Parts List

REF	PART #	DESCRIPTION
572	P4791572	LATHE SWITCH ASSEMBLY
572-1	P479174-1	ELECTRICAL BOX
572-2	P479174-2	SWITCH COVER
572-3	PS36	PHLP HD SCR 10-24 X 2-1/2
572-4	P479174-4	FWD/REV SWITCH
572-5	P479174-5	ON SWITCH
572-6	P479174-6	OFF SWITCH
572-7	P4791941	STRAIN RELIEF
601	PK154M	KEY 12 X 12 X 14
602	P4791602	LATHE SPINDLE
603	PK156M	KEY 12 x 12 X 28
604	P4791604	BEARING OIL SEAL
605	PSB15M	CAP SCREW M5-.8 X 20
606	P4791606	GASKET
607	P4791607	TAPPERED ROLLER BEARING 7112
608	P4791608	GEAR 48T
609	PR78M	EXT RETAINING RING 55MM
610	P4791610	END CAP
611	PSS35M	SET SCREW M4-.7 X 16
612	PORP040	O-RING 39.7 X 3.5 P40
613	P4791613	ROLLER BEARING 15 X 25MM
614	PR09M	EXT RETAINING RING 20MM
615	P4791615	GEAR 60T
616	P4791616	SHAFT SLEEVE
617	P4791617	GEAR 37T
618	P4791618	GEAR 26T
619	P4791619	KEY 6 X 6 X 65
620	P4791620	MIDDLE SHAFT
621	P4791621	RUBBER GASKET
622	P4791622	PLUG M20-1.5
623	P4791623	ROLLER BEARING 15 X 25MM
624	P4791624	END CAP
625	PSS08M	SET SCREW M4-.7 X 5
626	P4791626	TAPERED ROLLER BEARING 7110
627	P4791627	GASKET
628	PSB15M	CAP SCREW M5-.8 X 20
629	P4791629	END CAP
630	P4791630	BUSHING
631	P4791631	SPINDLE PULLEY

REF	PART #	DESCRIPTION
632	P4791632	SPANNER LOCK WASHER
633	P4791633	SPANNER NUT M50-1.5
634	PN02M	HEX NUT M10-1.5
635	PLW06M	LOCK WASHER 10MM
636	P4791636	GEAR 20T
637	PSS08M	SET SCREW M4-.7 X 5
638	P4791638	ROLLER BEARING 15 X 25MM
639	P4791109	BALL OILER 8MM
640	PEC10M	E-CLIP 9MM
641	PW04M	FLAT WASHER 10MM
642	P4791642	CHANGE GEAR 20T
643	P4791643	BUSHING
644	P4791644	GEAR 50T
645	P4791645	SPLINE
646	P4791646	SHAFT
647	P4791647	HEADSTOCK CASTING
648	P4791648	SPACER
649	P4791649	ROCKER ARM
650	PORP016	O-RING 15.8 X 2.4 P16
651	P4791651	GASKET
652	P4791652	INDENT PLATE
653	P4791653	STEEL BALL
654	P4791654	COMPRESSION SPRING .08 X 5 X 25
655	P4791655	HANDLE HUB
656	PRP30M	ROLL PIN 5 X 50
657	P4791657	HANDLE
658	P4791658	KNOB BM8-1 X 40
659	P4791659	SIGHT GLASS M16-1.5
660	PORP016	O-RING 15.8 X 2.4 P16
661	P4791661	OUTPUT SHAFT
662	P4791662	DUPLEX GEAR 39T
663	PR09M	EXT RETAINING RING 20MM
664	P4791664	ROLLER BEARING 15 X 25MM
665	PORP012	O-RING 11.8 X 2.4 P12
666	P4791666	END CAP
667	PSS35M	SET SCREW M4-.7 X 16
668	P4791668	KEY 6 X 6 X 70
669	PK05M	KEY 4 X 4 X 10
670	PFH05M	FLAT HD SCR M5-.8 X 12

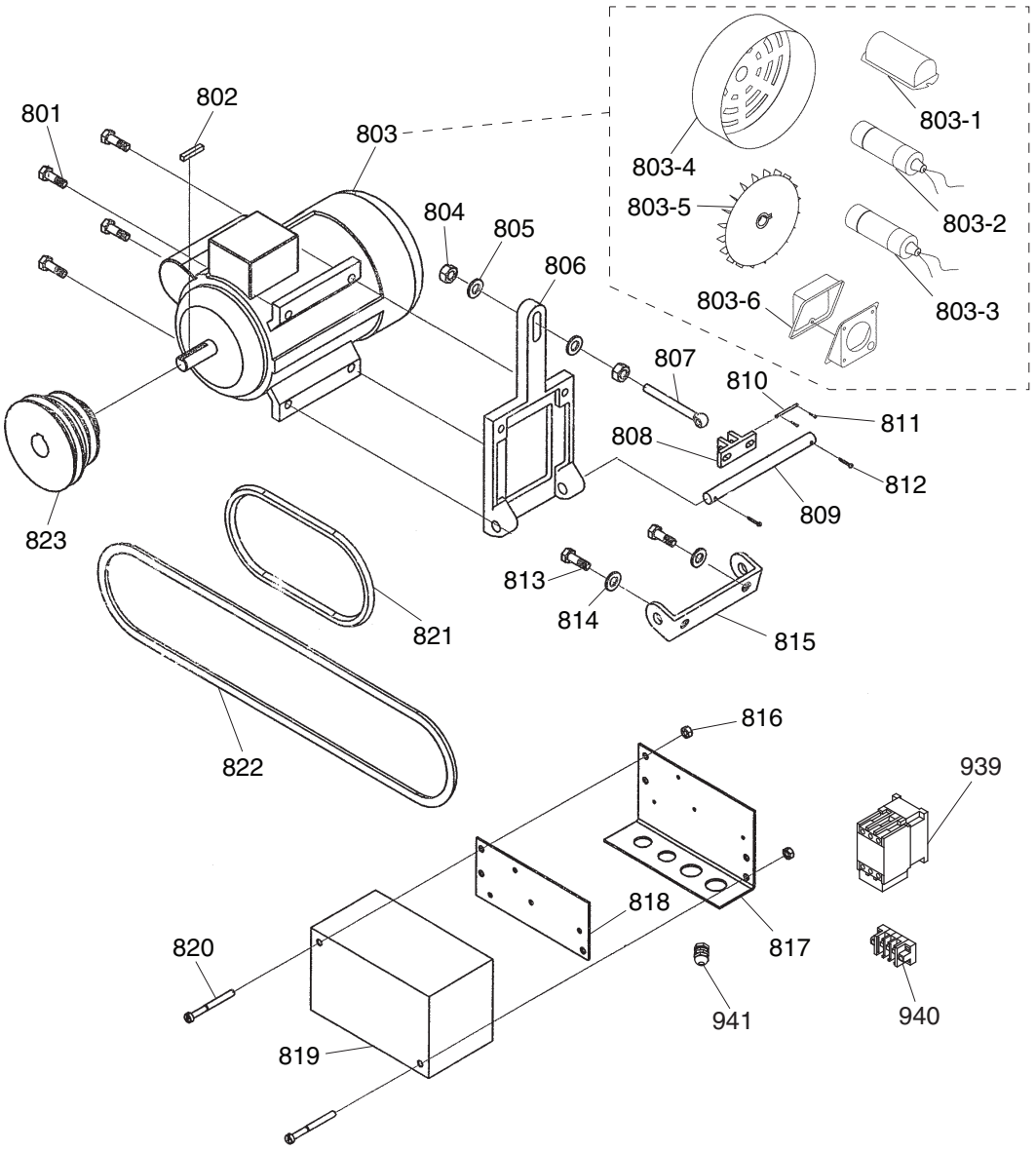
Change Gear Box Breakdown



REF	PART #	DESCRIPTION
701	P4791701	DOOR LATCH
702	P4791702	SHAFT
703	P4791703	TAPER PIN 3 x 18
704	P4791704	STAR GRIP KNOB 8 X 32
705	P4791705	BUSHING
706	P4791706	DOOR
707	P4791707	BUTT HINGE
708	P4791708	LATHE DRIVE SYSTEM CABINET
709	P4791709	PIVOT PLATE
710	P4791710	BUSHING
711	PFH05M	FLAT HD SCR M5-.8 X 12
712	P4791712	TENSION SPRING 2 X 12 X 61.5

REF	PART #	DESCRIPTION
713	P4791713	AXIS SHAFT
714	P4791714	AXIS SHAFT BRACKET
715	PS05M	PHLP HD SCR M5-.8 x 8
716	PEC12M	E-CLIP 12MM
717	P4791717	IDLER PULLEY BRACKET
718	PS05M	PHLP HD SCR M5-.8 x 8
719	P4791719	DEEP GROOVE BALL BEARING 203
720	P4791720	OUTER SPRING SLEEVE
721	P4791721	INNER SPRING SLEEVE
722	P4791722	DEEP GROOVE BALL BEARING 203
723	P4791723	IDLER PULLEY
724	PEC05M	E-CLIP 15MM

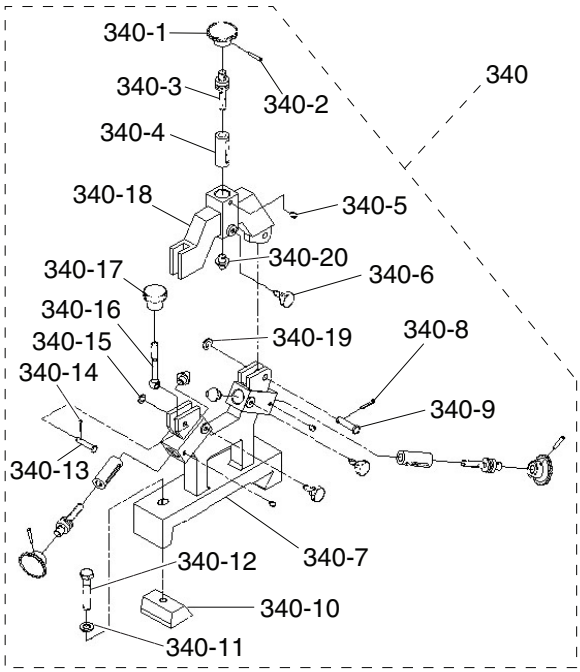
Lathe Motor Breakdown



REF	PART #	DESCRIPTION
801	PB07M	HEX BOLT M8-1.25 X 25
802	PK41M	KEY 8 X 8 X 40
803	P4791803	MOTOR 1-1/2HP 220V 1-PH
803-1	P4791803-1	CAPACITOR COVER
803-2	P4791803-2	S CAP. 150M 250V 1-1/4 X 3-1/8
803-3	P4791803-3	R CAP. 20M 450V 1-/58 X 3
803-4	P4791803-4	MOTOR FAN COVER
803-5	P4791803-5	MOTOR FAN
803-6	P4791803-6	MOTOR WIRING JUNCTION BOX
804	PN02M	HEX NUT M10-1.5
805	PW04M	FLAT WASHER 10MM
806	P4791806	MOTOR MOUNT
807	P4791807	DOG BOLT M10-1.5 X 70
808	P4791808	BRACKET
809	P4791809	AXLE SHAFT
810	PRP46M	ROLL PIN 6 X 28

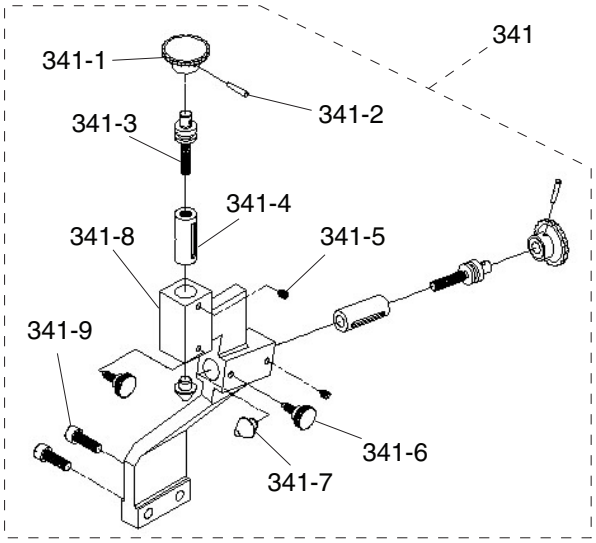
REF	PART #	DESCRIPTION
811	PRP99M	ROLL PIN 2 X 12
812	PRP42M	ROLL PIN 3 X 20
813	PB27M	HEX BOLT M12-1.75 X 30
814	PLW05M	LOCK WASHER 12MM
815	P4791815	MOTOR MOUNT BRACKET
816	PN01M	HEX NUT M6-1
817	P4791817	ELECTRICAL BOX MOUNT
818	P4791818	MOUNTING PANEL
819	P4791819	ELECTRICAL BOX
820	P4791820	SPECIAL SCREW
821	PVM26	V-BELT 3L260
822	PVM29	V-BELT 3L290
823	P4791823	MOTOR PULLEY
939	P4791939	MAGNETIC CONTACTOR
940	P4791940	TERMINAL BOARD 5P
941	P4791941	STRAIN RELIEF

Steady Rest Breakdown



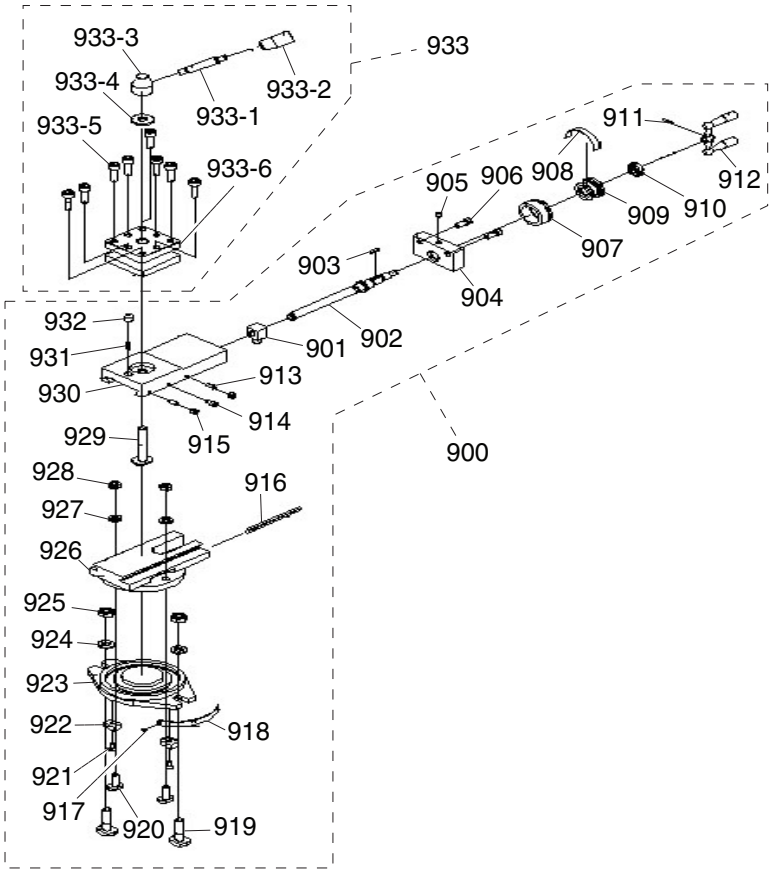
REF	PART #	DESCRIPTION
340	P4791340	STEADY REST ASSEMBLY
340-1	PSW03-1	KNOB
340-2	P4791340-2	TAPER PIN 3 X 22
340-3	P4791340-3	ADJUSTMENT BOLT
340-4	P4791340-4	ADJUSTMENT BOLT SLEEVE
340-5	PSS01M	SET SCREW M6-1 X 10
340-6	P4791340-6	KNURLED SCREW
340-7	P4791340-7	BOTTOM FRAME
340-8	PRP61M	ROLL PIN 3 X 12
340-9	P4791340-9	PIVOT PIN
340-10	P4791340-10	CLAMP SHOE
340-11	PW04M	FLAT WASHER 10MM
340-12	PB116M	HEX BOLT M10-1.5 X 45
340-13	P4791340-13	PIVOT PIN
340-14	PRP99M	ROLL PIN 2 X 10
340-15	PW03M	FLAT WASHER 6MM
340-16	P4791340-16	DOG BOLT
340-17	P4791340-17	KNOB
340-18	P4791340-18	UPPER FRAME
340-19	PW01M	FLAT WASHER 8MM
340-20	P4791340-20	FINGER

Follow Rest Breakdown



REF	PART #	DESCRIPTION
341	P4791341	FOLLOW REST ASSEMBLY
341-1	PSW03-1	KNOB
341-2	P4791340-2	TAPER PIN 3 X 22
341-3	P4791340-3	ADJUSTMENT BOLT
341-4	P4791340-4	ADJUSTMENT BOLT SLEEVE
341-5	PSS01M	SET SCREW M6-1 X 10
341-6	P4791340-6	KNURLED SCREW
341-7	P4791340-20	FINGER
341-8	P4791341-8	FRAME
341-9	PSB14M	CAP SCREW M8-1.25 X 20

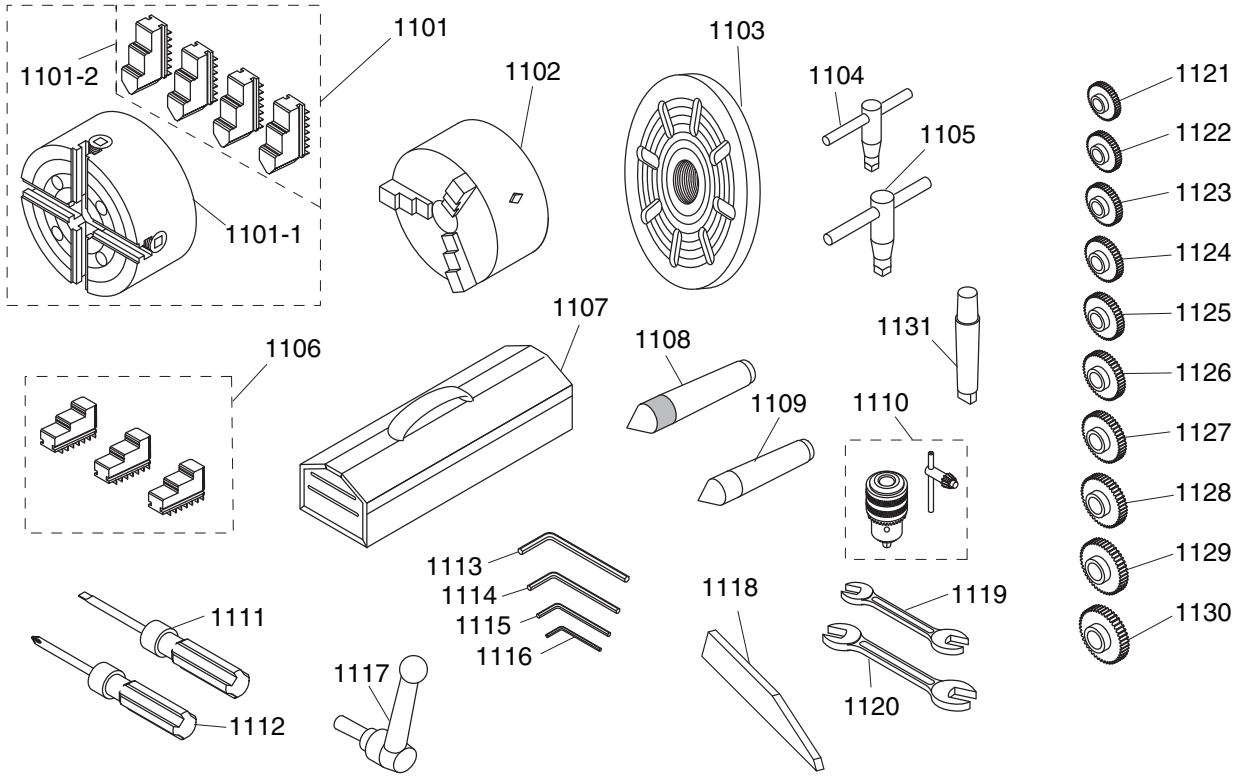
Compound Slide Breakdown



REF	PART #	DESCRIPTION
900	P4791900	COMPLETE COMPOUND ASSY
901	P4791901	LEADSCREW NUT
902	P4791902	COMPOUND SLIDE LEADSCREW
903	PK134M	KEY 4 X 4 X 14
904	P4791904	LEADSCREW BRACKET
905	P4791109	BALL OILER 8MM
906	PSB01M	CAP SCREW M6-1 X 16
907	P4791907	GRADUATED DIAL
908	P4791908	SPRING INDICATOR
909	P4791909	BUSHING
910	P4791910	SPANNER NUT
911	P4791911	TAPER PIN 3 X 16
912	P4791912	DUAL BALL HANDLE
913	PSS34M	SET SCREW M5-.8 X 14
914	PSB50M	CAP SCREW M5-.8 X 10
915	PN06M	HEX NUT M5-.8
916	P4791916	GIB
917	P4791917	RIVET
918	P4791918	ANGLE SCALE
919	P4791919	T-BOLT M10-1.5 X 30

REF	PART #	DESCRIPTION
920	P4791920	SPECIAL T-BOLT
921	PS02M	PHLP HD SCR M4-.7 X 12
922	P4791922	BLOCK
923	P4791923	COMPOUND SLIDE MOUNT
924	PW04M	FLAT WASHER 10MM
925	PN02M	HEX NUT M10-1.5
926	P4791926	COMPOUND SLIDE BASE
927	PW01M	FLAT WASHER 8MM
928	PN03M	HEX NUT M8-1.25
929	P4791929	TOOL POST BOLT
930	P4791930	COMPOUND SLIDE TOP
931	P4791931	COMPRESSION SPRING
932	P4791932	PLUNGER
933	P4791933	TOOL POST ASSEMBLY
933-1	P4791933-1	HANDLE
933-2	PSW03-1	KNOB
933-3	P4791933-3	HANDLE HUB
933-4	P4791933-4	SPECIAL WASHER
933-5	PSB31M	CAP SCREW M8-1.25 X 25
933-6	P4791933-6	TOOL POST BASE

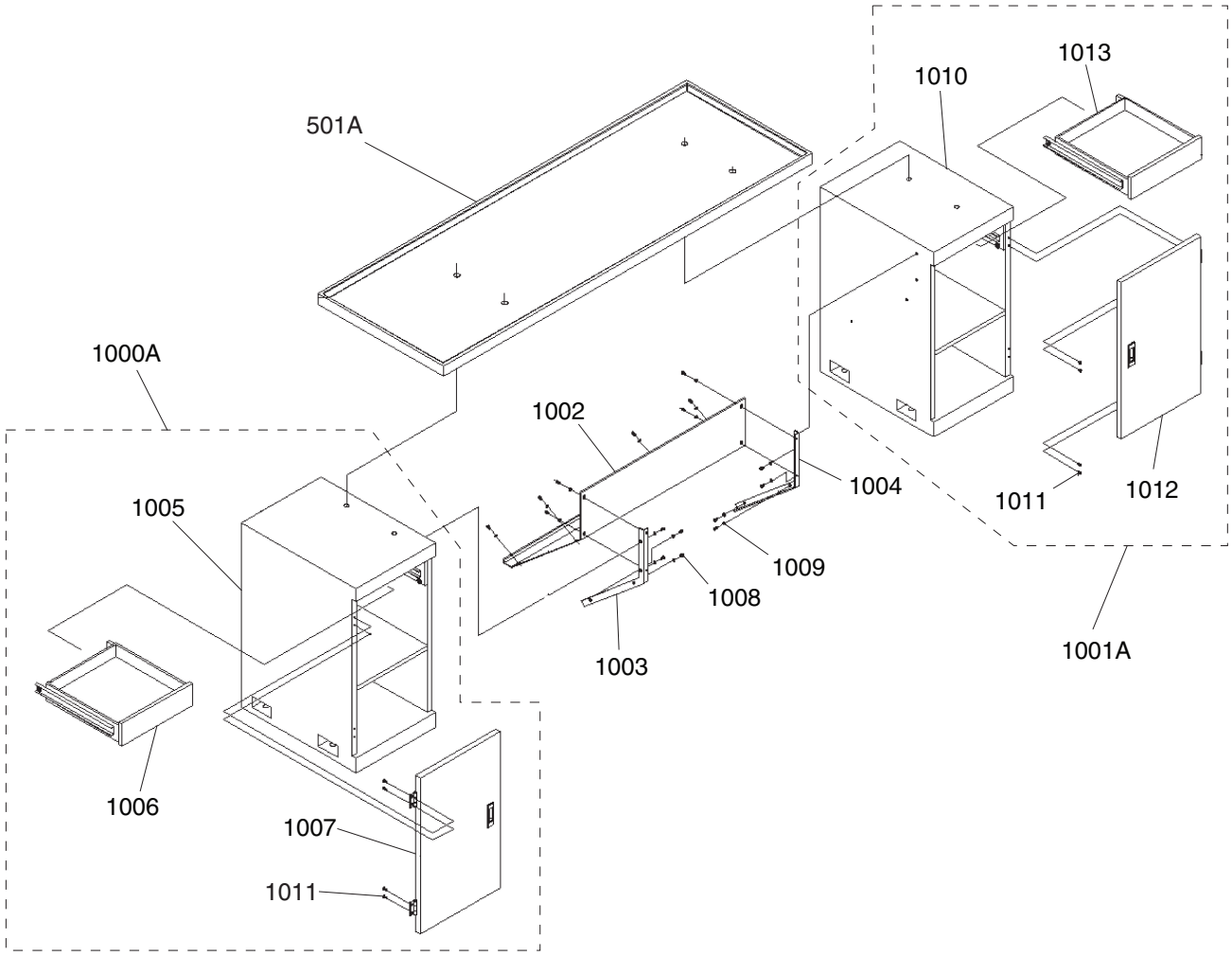
Accessories Breakdown



REF	PART #	DESCRIPTION
1101	P47911101	4-JAW CHUCK ASSY 8"
1101-1	P47911101-1	4-JAW CHUCK 8"
1101-2	P47911101-2	JAW SET FOR 4-JAW CHUCK
1102	P47911102	3-JAW CHUCK ASSY 6"
1103	P47911103	FACEPLATE 8"
1104	P47911104	3-JAW CHUCK KEY
1105	P47911105	4-JAW CHUCK KEY
1106	P47911106	EXT. JAW SET FOR 3-JAW CHUCK
1107	P47911107	TOOLBOX
1108	P47911108	DEAD CENTER MT#5
1109	P47911109	DEAD CENTER MT#3
1110	P47911110	DRILL CHUCK B16 & KEY
1111	PSDF2	SCREWDRIVER FLAT #2
1112	PSDP2	SCREWDRIVER PHILLIPS #2
1113	PAW06M	HEX WRENCH 6MM
1114	PAW05M	HEX WRENCH 5MM
1115	PAW04M	HEX WRENCH 4MM

REF	PART #	DESCRIPTION
1116	PAW03M	HEX WRENCH 3MM
1117	P47911117	CRANK HANDLE
1118	P47911118	DRIFT KEY
1119	PWR810	WRENCH 8/10
1120	PWR1719	WRENCH 17/19
1121	P47911121	CHANGE GEAR 22T
1122	P47911122	CHANGE GEAR 24T
1123	P47911123	CHANGE GEAR 25T
1124	P47911124	CHANGE GEAR 26T
1125	P47911125	CHANGE GEAR 27T
1126	P47911126	CHANGE GEAR 28T
1127	P47911127	CHANGE GEAR 30T
1128	P47911128	CHANGE GEAR 34T
1129	P47911129	CHANGE GEAR 38T
1130	P47911130	CHANGE GEAR 42T
1131	P47911131	ARBOR B16-MT#3

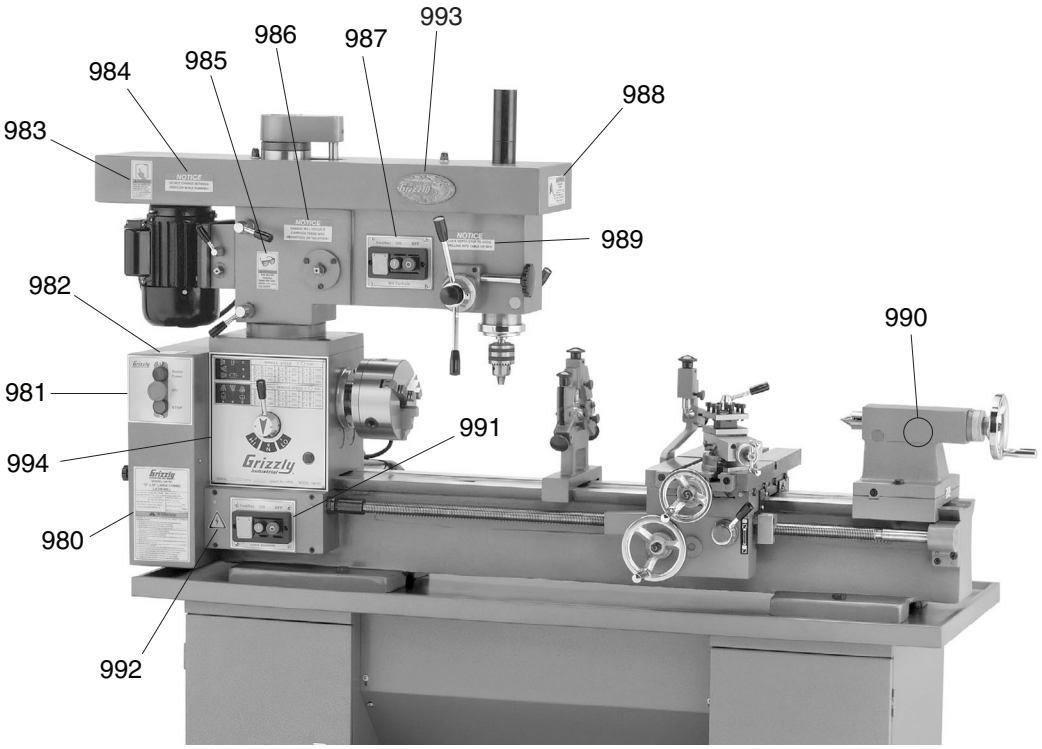
Cabinet Stand Breakdown



REF	PART #	DESCRIPTION
501A	P4791501A	CHIP PAN
1000A	P47911000A	COMPLETE LEFT CABINET ASSY
1001A	P47911001A	COMPLETE RIGHT CABINET ASSY
1002	P47911002	CENTER PANEL
1003	P47911003	CENTER PANEL BRACKET LEFT
1004	P47911004	CENTER PANEL BRACKET RIGHT
1005	P47911005	CABINET LEFT
1006	P47911006	CABINET DRAWER LEFT

REF	PART #	DESCRIPTION
1007	P47911007	CABINET DOOR LEFT
1008	PS38M	PHLP HD SCR M4-.7 X 10
1009	PW05M	FLAT WASHER 4MM
1010	P47911010	CABINET STAND RIGHT
1011	PS07M	PHLP HD SCR M4-.7 X 8
1012	P47911012	CABINET DOOR RIGHT
1013	P47911013	CABINET DRAWER RIGHT

Label Placement



REF	PART #	DESCRIPTION
980	P4791980	MACHINE ID LABEL
981	P4791981	MAIN POWER SWITCH LABEL
982	P4791982	DISCONNECT LABEL VERT
983	PLABEL-12	READ MANUAL LABEL VERT
984	P4791984	LATHE RANGE NOTICE
985	P4791985	EYE HAZARD LABEL VERT
986	P4791986	CARRIAGE CRASH NOTICE
987	P4791987	MILL SWITCH LABEL

REF	PART #	DESCRIPTION
988	P4791988	ENTANGLEMENT HAZARD LABEL
989	P4791989	DEPTH STOP NOTICE
990	PPAINT-1	GRIZZLY GREEN TOUCH UP PAINT
991	P4791991	LATHE SWITCH LABEL
992	PLABEL-14	ELECTRICITY LABEL
993	G9987	GRIZZLY OVAL NAMEPLATE SMALL
994	P4791994	LATHE HEAD SPEED LABEL

⚠WARNING

Safety labels warn about machine hazards and ways to prevent injury. The owner of this machine MUST maintain the original location and readability of the labels on the machine. If any label is removed or becomes unreadable, REPLACE that label before using the machine again. Contact Grizzly at (800) 523-4777 or www.grizzly.com to order new labels.

WARRANTY CARD

Name _____

Street _____

City _____ State _____ Zip _____

Phone # _____ Email _____ Invoice # _____

Model # _____ Order # _____ Serial # _____

The following information is given on a voluntary basis. It will be used for marketing purposes to help us develop better products and services. ***Of course, all information is strictly confidential.***

1. How did you learn about us?

____ Advertisement ____ Friend ____ Catalog
____ Card Deck ____ Website ____ Other:

2. Which of the following magazines do you subscribe to?

____ Cabinet Maker
____ Family Handyman
____ Hand Loader
____ Handy
____ Home Shop Machinist
____ Journal of Light Cont.
____ Live Steam
____ Model Airplane News
____ Modeltec
____ Old House Journal
____ Popular Mechanics
____ Popular Science
____ Popular Woodworking
____ Practical Homeowner
____ Precision Shooter
____ Projects in Metal
____ RC Modeler
____ Rifle
____ Shop Notes
____ Shotgun News
____ Today's Homeowner
____ Wood
____ Wooden Boat
____ Woodshop News
____ Woodsmith
____ Woodwork
____ Woodworker West
____ Woodworker's Journal
____ Other:

3. What is your annual household income?

____ $20,000-$29,000 ____ $30,000-$39,000 ____ $40,000-$49,000
____ $50,000-$59,000 ____ $60,000-$69,000 ____ $70,000+

4. What is your age group?

____ 20-29 ____ 30-39 ____ 40-49
____ 50-59 ____ 60-69 ____ 70+

5. How long have you been a woodworker/metalworker?

____ 0-2 Years ____ 2-8 Years ____ 8-20 Years ____ 20+ Years

6. How many of your machines or tools are Grizzly?

____ 0-2 ____ 3-5 ____ 6-9 ____ 10+

7. Do you think your machine represents a good value? _____Yes _____No

8. Would you recommend Grizzly Industrial to a friend? _____Yes _____No

9. Would you allow us to use your name as a reference for Grizzly customers in your area?
Note: *We never use names more than 3 times.* _____Yes _____No

10. Comments: _____

_____

_____

_____

CUT ALONG DOTTED LINE

FOLD ALONG DOTTED LINE

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GRIZZLY INDUSTRIAL, INC.
P.O. BOX 2069
BELLINGHAM, WA 98227-2069

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Send a Grizzly Catalog to a friend:

Name_____

Street_____

City_____State_____Zip_____

TAPE ALONG EDGES--PLEASE DO NOT STAPLE

WARRANTY AND RETURNS

Grizzly Industrial, Inc. warrants every product it sells for a period of **1 year** to the original purchaser from the date of purchase. This warranty does not apply to defects due directly or indirectly to misuse, abuse, negligence, accidents, repairs or alterations or lack of maintenance. This is Grizzly's sole written warranty and any and all warranties that may be implied by law, including any merchantability or fitness, for any particular purpose, are hereby limited to the duration of this written warranty. We do not warrant or represent that the merchandise complies with the provisions of any law or acts unless the manufacturer so warrants. In no event shall Grizzly's liability under this warranty exceed the purchase price paid for the product and any legal actions brought against Grizzly shall be tried in the State of Washington, County of Whatcom.

We shall in no event be liable for death, injuries to persons or property or for incidental, contingent, special, or consequential damages arising from the use of our products.

To take advantage of this warranty, contact us by mail or phone and give us all the details. We will then issue you a "Return Number,'' which must be clearly posted on the outside as well as the inside of the carton. We will not accept any item back without this number. Proof of purchase must accompany the merchandise.

The manufacturers reserve the right to change specifications at any time because they constantly strive to achieve better quality equipment. We make every effort to ensure that our products meet high quality and durability standards and we hope you never need to use this warranty.

Please feel free to write or call us if you have any questions about the machine or the manual.

Thank you again for your business and continued support. We hope to serve you again soon.

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